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THE FLOATING GARDENS OF LAKE SRINAGAR.

THE magnificent valley of Cashmere is about 5,800 feet above the sea level. Lake Srinagar, which is no less than a mile in length, is one of the most beautiful ornaments of this incomparable region; at the east it touches the chain of mountains which stretch away toward the Budraward Kistawar and Yawiskar; at the south it bathes the foot of the mountain where is situated the Hindoo temple Turkt-i-Suliman; at the west, the city of Srinagar; and at the north it is bounded by the mountains of Central Thibet. The eastern part includes a charming site, which has proved very attractive to the Mogul emperors, and here they have established their summer residence, at the foot of a chain of mountains where there is a never-failing supply of water derived from the melting snows and high glaciers.

One of the curiosities of this delightful region are the floating vegetable gardens which are to be seen on the lake. Since there is little known about these, a short description of them may not prove uninteresting to the reader. Although this mode of culture on floating rafts seems a curious one, the products that are yielded therefrom are said to be very fine. In establishing these aquatic gardens, the natives, having first selected a convenient site, begin by planting thereon poplar poles (Fig. 1, A, B, C) 25 to 28 feet in length, and in two or three rows, 12 to 15 feet apart, according to the length and breadth that they wish their plantations to be. Having done this, they gather from the lake a number of aquatic plants, roots and all, and interweave them among the stakes. These herbs, which keep on growing, form the support for the garden. Next, they collect more plants from the bottom of the lake, and pile them on the latter to a height of three or four inches. Being deprived of water and exposed to the heat of the sun, these plants soon wither and enter into decomposition. While the raft and the plant-hills (the latter 3 to 6 feet apart) are being prepared, the sowing of the seeds is begun in the vicinity of the gardener's dwelling on a small island in the lake. The seeds of the various plants to be raised, such as pumpkins, muskmelons, watermelons, vegetable marrows, tomatoes, etc., are sown in small hillocks, shaped by hand into the form of a bird's nest, and composed of the debris of plants of the preceding year. These sowings are covered every night with matting. Fifteen or twenty days later, the young seedlings are taken up and carried to the raft prepared for their reception. At first, the young plants are watered, but this is soon rendered unnecessary from the fact that the rootlets gradually work their way downward through the plant-hills and obtain their supply of moisture from the water of the lake. The vegetables are gathered during the entire summer just as fast as they ripen, by means of small skiffs which are rowed around the rafts. The vegetables are taken to the city and sold on the shores, which the inhabitants of Srinagar visit to obtain their supplies. The products are sold at fabulously cheap prices. The rafts or floating gardens last for many years, the rotting of the poles being the only thing that puts a limit to their existence. It is only necessary then to renew these from time to time to have the raft last for an indefinite period. Although the rafts can be moved, they are, as a general thing, stationary and fixed at the spot which the cultivator deems most advantageous. When the water rises, the garden rises with it, and again falls when the water becomes low again, and this motion causes no injury to either the raft or its vegetation. A person arriving in the midst of these gardens in the evening might imagine himself in a seaport among a lot of vessels rising and falling with the tide.

The number of vegetables, or rather edible plants, produced by Lake Srinagar, is wonderful. In addition to the direct products of cultivation, it yields others which come naturally, such as lotus roots, which look just like enormous

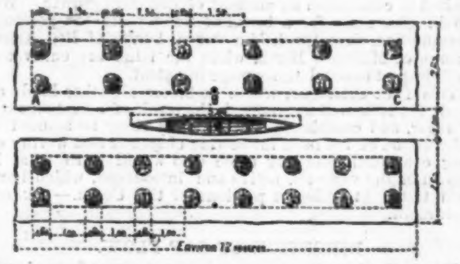


FIG. 1.—PLAN OF TWO FLOATING GARDENS, AND OF THE SKIFF FOR VISITING THEM.

shoots of asparagus, but have neither the taste nor odor of the latter. But the *seeds* of the lotus are excellent and remind one of fresh hazel-nuts. The water-caltrops or water-chestnuts (*Trapa natans*) abound here, as do a large number of *Nymphaceæ*, the seeds or roots (sometimes both) of which are eaten.

Floating gardens similar to those above described by a correspondent of *La Nature* were also known to the primitive Aztecs, who constructed rafts of woven weeds and rushes, and covered them with the fertile sediment drawn up from the lake. Upon these gardens, gradually extending to 200 or 300 feet in length, the Indians cultivated flowers and vegetables for the market of Tenochtitlan. Some of these gardens, or *chinampas*, as they were called, were firm enough to sustain small trees and a hut, and could be moved about with a pole or fastened to it at the will of the owner. Prescott describes these *chinampas* of Mexico as an archipelago of wandering islands.

INDIAN TEA.

Now that the manufacturing season has begun, it is well that every thought should be given to improve the quality of our teas so as to avoid the reproach of inferiority which was last year so freely bestowed. The difficulty, however, is to ascertain to what special causes the inferiority complained of is due, for although the teas from almost all districts (save a few from Darjeeling) were more or less condemned, there was not anything like unanimity of opinion as to the causes which had led to so marked a falling off. Many of the trade at home assert that the defect was not in the leaf, but only in the manufacture; but to leave out of consideration the effect of special climatic conditions, or the extent to which good or bad cultivation may affect quality, is to only half cope with the subject. At times, all the care in manufacture in the world will not secure point and flavor. If cultivation has been neglected, you will not get succulent healthy leaves, without which good tea cannot be manufactured; and if the weather or blight is against you, your leaf may harden, and be difficult to wither and roll properly. Again, if leaf be plucked with too much regard to quantity, you can certainly not expect a very high standard of quality. The causes which go to make a successful or unsuccessful out-turn are many and various, and it is the height of unwisdom to set them down to one class of causes alone, as by this means real remedy becomes almost impossible. To the strictures of the trade, therefore, upon the tea *maker*, the experienced planter will reply that the like thought, care, and attention recommended in the *manufacture* of the leaf is equally needed, first of all in the garden, and that if the matters be at all neglected *there*, the best of manipulation and manufacture will hardly put things right; and it is because it is impossible to lay *too* much stress upon manufacture alone, that we have made these remarks. We are glad to know that increased attention is being given to the subject of cultivation; and where this is the case, we have the best *starting point* for excellence of quality.

Coming, now, to a special consideration of the complaints as to imperfect manufacture, and the consequent stated deterioration of Indian tea, we find the trade inclined to attribute a good deal to the introduction of machinery. They say that the leaf is rolled before it is sufficiently withered, and that the manipulation which the leaf formerly received by hand rolling is not obtainable by the machines invented. As to rolling, we possess now the means to treat a large quantity of leaf in a short time—a manifest advantage where, as is so often the case, leaf comes in too rapidly for the ordinary appliances of hand manufacture. Where withering is inefficient, it will generally be found due to want of adequate space. Many a planter has been often at his wits,

FIG. 2.—GENERAL VIEW OF THE FLOATING VEGETABLE GARDENS OF LAKE SRINAGAR.

ends to know where to put out his leaf, and has had to be content with thick layers when he would wish to have thinly spread out, as he knew should have been done. Owners would do well, therefore, to provide a full allowance of withering accommodation. After the first necessity of good cultivation and judicious plucking, withering comes next in importance; and we are inclined to believe that to a neglect of necessary precautions on this head some of the want of flavor complained of is due; for not only should the withering loft be sufficiently large, but it needs to be sufficiently light and airy, and that it be kept to a uniform temperature, so as to prevent the leaf from getting over dry and dis colored. To secure uniformity of temperature, you must have the means of ventilation; yet, often, the effect of galvanized iron roofing on the temperature of the loft proves a serious drawback—during the day time the heat becoming too great, and not able to be kept under due control. We hold, therefore, that if iron roofing be used, felt lining should be used beneath it. A stated time for withering cannot be laid down, but the particular circumstances of each building, of the state of the weather, and the condition of the leaf itself, have all to be studied to secure the most essential point of good tea manufacture—perfect withering.

It is well to be told of our faults, and planters are not unwilling to receive advice from the trade and from brokers; but where blame is given for imperfection in manufacture, the circumstances under which a man has to work should be taken into account. While commending, therefore, to the tea maker the desirability of the greatest attention to every phase of manufacture, we say, also, to owners, put your factory in a satisfactory condition to satisfy all essential requirements. As regards the question as to whether machine rolling is chargeable with anything to the detriment of Indian tea manufacture, we think the conclusion that nine out of ten will arrive at is, that such an idea cannot be well sustained. Most planters are now in favor of machine rolling because of the great advantages its rapidity in working off the leaf permits, although it is not denied that in hand-rolling you perhaps get a more perfect twist, as well that the diminutive cells of which the leaves are constructed are more directly acted upon by the hand in way of the necessary breaking and bruising, in the case of a small ball, than where, as in the machine, so many pounds of leaf are operated upon at one time. Some tea makers, even now, give a final slight hand rolling. The danger, to the inexperienced, with machine rolling is, perhaps, that they may roll too heavily; but a little practice soon shows the pressure that is desirable. The complaint at one time urged against rolling machines—that the iron with which the leaf came in contact had an effect on the flavor of the tea—now hardly holds good, since iron has, in all places of contact, been replaced by wood. Altogether, then, we dismiss the idea suggested by the trade that the introduction of machinery has anything to do with the asserted deterioration of Indian tea.

Next to withering, probably correct fermentation has the most potent influence in the quality and flavor of tea. There is much difference of opinion on this question of fermentation, but the balance of testimony, we think, points to the desirability of fermenting up to the point of copper tint, and no further. In this question of fermentation, much scientific truth and fact is involved, and we think that planters have perhaps hardly devoted that attention to the scientific aspect of the question which the importance of the subject demands. In the *Tea Cyclopædia*, just issued, will be found much valuable comment on this matter, and we commend to our readers a perusal of those papers. In fact, on the question of tea cultivation and manufacture generally, as well as of tea science, a mine of information and instruction has been gathered together in the volume referred to, which every planter in India should make himself closely familiar with.

To sum up, then, in regard to the well-intentioned remarks of the London professional trade on the stated deterioration of Indian tea, we say, that while not denying that our system of manufacture may be improved, we would have every regard paid primarily to good cultivation, and we would ask owners to perfect (where needed) the arrangements of their factories so as to permit of necessary essentials being observed in the process of manufacture.

Another thing we would venture to suggest is, that a tea planter or tea maker is not born ready made; that *experience* is an essential qualification; and that the reverse of economy may result from the displacement of old hands, and the substitution of new and inexperienced ones. So long as Indian tea fetched good prices by reason of the comparatively limited quantity sent forward, so much regard was not paid to quality, because it could always take a foremost rank over China, and was easily absorbed. With an increase of production came a closer scrutiny; and now we see that though our finer teas still hold their place, we cannot compete with China in our inferior grades. The lesson is, that we must not only find new fields, but that we must seek to still more firmly secure, by improved excellence of quality, that field—the London market—which, to us, must always be the mainstay of our product.—*Indian Tea Gazette.*

AMERICAN APPLES.

THE "Fruit Catalogue" of the American Pomological Society is unequaled in the information which it furnishes on the adaptedness of the 321 varieties of the apple which it names, to the different States and Territories of America. Scarcely any attempt of this character has ever been made before, and there is nothing which approaches it for the completeness of the information which it gives. Under the able supervision of P. Barry, the chairman of the General Fruit Committee, it has gradually grown to its present degree of excellence and value, and although changes, as a matter of course, will be made in future as new facts and new results of culture are afforded, it has become an authority of great value to planters of orchards in the different regions of the country at large. It will be understood, however, that it does not attempt to give the exact value of every variety, or of the fitness of each sort, old or new, to every place, but the combined results, so far as full trial has been made by intelligent cultivators throughout the Union.

On looking over this catalogue, the eye distinctly catches at a glance the lines of stars which express the value of each sort, under the heads of the fifty States and Territories, so far as a trial has been sufficiently made. The apple which has the largest number of votes, or which so far as tried has the widest adaptation, is the Red Astrachan—a fruit nowhere possessing high quality in itself, but for hardiness, productiveness, and fair appearance, holding high rank for general value in market. It is starred in no less than thirty-seven States, as recommended for cultivation, and in twenty-six of these it is double starred, to show its superiority. Next to this in wide adaptedness is the Early Harvest, recommended in thirty-five States, and of superior character in sixteen. Maiden's Blush, a fruit like Red Astrachan, of quite moderate flavor, is starred for thirty-two States, and double starred for fourteen, indicating the success of its culture through a wide region of country. Next to these, the succeeding sorts follow in the order of the large vote they have received: Gravenstein, Fall Pippin, Porter, Fameuse, Winesap, Duchess of Oldenburgh, Primate, Carolina Red June, Yellow Bellflower, American Summer Pearmain, Summer Rose, Hubbardston Nonesuch, Baldwin, Ben Davis, Rhode Island Greening, Tallman Sweet, Peck's Pleasant, Williams' Favorite, Northern Spy, Rambo, Sops of Wine, Benoni, Jonathan, Twenty Ounce—all which stand as adapted to twenty or more States and Territories. Roxbury Russet is recommended in nineteen States, and has double stars in seven.

It should be observed that there are some varieties, which have not so full a general vote as some others, which are nevertheless far more really valuable in the regions to which they are adapted. For example, Baldwin and Rhode Island Greening at the East, and Ben Davis at the West, having each little more than one-half as many votes as Red Astrachan, are more profitable in places where they succeed best. The Baldwin and Rhode Island Greening head the lists in several of the Eastern States, and the Ben Davis at the West, but their value is nearly confined to those regions. The Baldwin has only two votes west of Michigan; and the Ben Davis only three east of Michigan. Among the sorts which show by the lines of double stars their popularity in the Southern States only, are Stevenson's Winter, Taunton, Horse, Family, Julian, Mangum, Nickajack, Shockley, and Yellow June. Among the apples popular only in the West are Willow Twig, White Winter Pearmain, Rome Beauty, Gilpin, Pryor's Red, and White Pippin.

There are some apples of newer introduction, like the Wealthy, which possess very valuable qualities, and have as yet received only two or three votes, which will doubtless stand high for general popularity when they become known. There are others of much excellence, like the Swaar and Red Canada, which, although long known, are limited in cultivation on account of defective growth. We would give more for a barrel of fine Swaars for personal consumption, than for half a dozen barrels of Red Astrachan or of Maiden's Blush, while the latter are cultivated doubtless a thousand times more in extent.

This fruit catalogue, which embraces all other kinds of hardy fruits as well as apples, is the result of a vast amount of labor, and contains in a compressed shape an amount of information of the most interesting character and worthy of long continued study by those who would learn what is known of the varieties, native and introduced, which have been tested in different portions of the Union.—*Country Gentleman.*

DIRECTION OF SAP FLOW.

THE bulk of sap that sugar-makers get comes from above. This fact I have just obtained by three experiments, all corroborating each other. 1st experiment—I went to two trees already tapped with one spout and running by the watch, one of them 100 drops per minute, and the other 110. Going to the first tree, with the same bit, I bored another hole directly above the other, of the same depth, by guess, and about one inch higher. Instantly, before I could get the bit out of the tree, I saw that I had arrested the flow of sap from the first spout. Now, counting the drops, by the watch, I find the first spout running 60 drops per minute, and the other, or upper, 44 drops, which makes a loss of 40 drops, and a gain of 44 drops, making only 4 drops of clear gain for an extra spout. Second tree, running 110 drops, I bored as I did the other, above, reducing it to 72 drops, while the new bore run 52 drops, making a loss of 38 drops, and a gain of 52—a clear gain of 14 drops. The above is my first test.

2d.—Wishing to test the same point in another way, I went to three other trees, and using the same bit, bored an equal hole six inches above the others, and filled them solid full of butter salt, driving firmly a good fitting plug, and in one hour, the spout, six inches below, in one tree, was running perfect brine, as several witnesses can attest, and in about four hours the salt was all out, as the sap had then no briny taste. This tree, being one of my shade trees close to my house, was watched closely. The other two trees were in my sugar orchard, and when I went to them one was running brine, and the other was unaffected; this was a mystery. Two other trees I plugged with salt six inches below the spout; one of them gave no briny taste whatever, while the other for a short time was a little brackish to the taste. The conclusion to be drawn from this experiment would be that the bulk of the circulation this time of the year is downward, and only a fraction is upward. I regard this test as being conclusive that a tapped tree, when there are no leaves, and the conditions are right, circulates its sap in both directions.

3d experiment.—I bored a hole through a low limb of a maple, which was four inches in diameter. I then fitted a plug flattened on two opposite sides, and drove it through the limb, with the flattened sides facing the two opposite directions, catching the sap separately. The result was two to one; the sap in the direction of the tree was one, while it was two from the limb down.

In connection with the first experiment, I should have mentioned two other facts. In looking over these trees on a cool day, three of them were running, but in every case it was from the upper spouts, and none from the lower ones. On going to them again on another occasion, five upper spouts were running respectively, 13, 4, 2, 7, and 3 drops, while the lower ones were running one drop each, or, to sum it up, the upper spouts run 29 drops, while the lower ones run 5 drops. The conclusion seems to be clear that the main bulk of the sap which we get from a tapped tree comes down, rather than up. Will those who believe that the sap comes up from the roots, while we are sugaring, explain this? Another class, including botanists, believe that the sap obtained in the spring was stored up in the tree the fall previous. Will this class explain why it is that the top of a tree, which contains the largest per cent. of water, runs the least sap, while that part of the tree near the ground, which has the least per cent. of water, runs the most?

Professor Clark's experiments led him to the belief that there was but little sap above twenty feet from the ground. My observations lead me to the same conclusion.—*Timothy Wheeler, in N. E. Farmer.*

THE HOUSE WREN AS AN INSECT DESTROYER.

ORNITHOLOGISTS and entomologists are always most properly and sensibly urging upon people the duty and necessity of protecting the birds. In fact, when any destructive insect appears in overwhelming numbers, the good offices of our feathered friends would seem to be almost our sole dependence for protection from their ravages. And yet our laws and usages are singularly defective, regarded simply from a selfish point of view—leaving humanity entirely out of the question. But the matter is constantly forcing itself upon public attention, and gradually we shall make laws which ought to have been upon our statute books from the foundation of the government. In the meantime let us all, who have this subject at heart, keep on "preaching" until this glorious end is achieved. The observations I have been able to make during a residence of several years on a farm have convinced me that the common house wren is really one of our most valuable birds, not, perhaps, for what they have done, but from the possibilities wrapped up in their diminutive bodies. They are quite as social as the purple martin or the bluebird, and greatly surpass both of these in the rapidity with which they increase. I began several years ago to provide them with nesting-places in the vicinity of my buildings. Sometimes I fastened the skull of a horse or ox, or a small box, in a tree-top. But latterly I have made it a practice every spring to obtain thirty or forty cigar boxes for this purpose. If the box is long and large, I put a partition across the middle and make a hole through into each apartment. It is very seldom that these boxes are not occupied by one of these little families. In most instances two broods are annually reared in each nesting place. One of my boxes last season turned out three broods of young wrens—six little hungry birds each time, or eighteen in all! I think a cigar box never before did better duty. The lamented Robert Kennicott stated that a single pair of wrens carried to their young about a thousand insects in a single day! Like all young, rapidly growing birds, they are known to be most voracious eaters, living entirely upon insects. The point upon which most stress may be laid is this: That by providing them with nesting-places in our gardens, orchards, or grounds, and not allowing them to be caught by cats or scared away by mischievous boys, we may have scores if not hundreds of them about us during most of the time in which insects are destructive. They undoubtedly return to the same localities to rear their young year after year. Last season I had up about thirty of these nesting-boxes, and all but two or three, which were not favorably located, were occupied. My crop of wrens could scarcely have been less than one hundred and fifty, and the old birds filled the air with music when they were not on duty in building their nests or feeding their young! The coming spring I intend to put up at least a hundred of these nesting-boxes in my orchards and groves, and I have no doubt I shall be repaid a hundred thousand fold for the little labor it costs. As long as they come back so regularly every year and in constantly increasing numbers, and serve me so well, I shall do all in my power to protect and encourage them. And I am of the opinion that when one species of social, useful birds can be made to congregate in such unusual numbers, others will come also. But the hardiness, sociability, love of the locality where it was reared, and wonderful fecundity of the little house wren, render it, in my judgment, one of the most valuable of all our insectivorous birds.—*Charles Aldrich, Webster City, Iowa, in American Naturalist.*

THE GREAT BEE DISASTER.

BEE-KEEPERS throughout the length and breadth of the North are now mourning over their losses of the winter; many in utter despair, while others who are so fortunate as to have a little seed left over, "are casting about inquiring" what "the signs of promise are." The clovers have wintered splendidly, and the busy workers are to-day bringing in "bee-bread," so that he who has "a few more left" can take fresh heart. Following last season's failure of honey sources, on which mainly my prophecy was predicted, the longest continuous winter confinement of the bees to their hives that I have ever known has occurred. From different localities come various and seemingly conflicting experiences, it is true; but from all the sad wail of woe is borne on the dismally sighing, belated wintry winds.

In some locations, and under favorable conditions, it has been found possible for the bee-master to give to a few stocks an airing, for purification, once or twice during the winter, which, with such other safe-guards as scientific modern bee-keeping suggests, have enabled some few to report tolerable success in wintering; but in *this locality* (Battle Creek, Mich.) no opportunity for a purifying flight occurred between the 20th day of October, 1880, and the 15th day of April inst. Not once in all that long and dreary period has the noon-day sun vouchsafed his genial rays, fanned by the south wind with the mercury 46 degrees and above in the shade for one single hour!

Once only, for a few moments, did the air and sunshine promise favorably, and the bees ("blessed bees" were they) that ventured out by the treacherous lure were caught in the arms of a sudden blast that sprang up like a thief out of the northeast, and beat the most of them down into a winding sheet of "the beautiful snow."

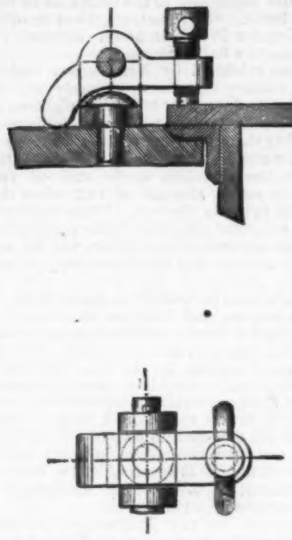
Probably three-fourths of all the bees that went into winter quarters last October, in Michigan, have perished, and possibly more. Many have lost all, and among those are some of our hitherto most successful bee-keepers, such as have passed through the severe ordeal in fair order, had placed their stocks in cellars, or packed them in other protected quarters.

With such winters as the two last past—the one phenomenally warm, and the other unprecedentedly long and cold—a chaff hive, or one with double walls, seems to be almost a necessity. At any rate, when the winter is unusually warm, as well as when too cold and severe for unprotected outdoor wintering, such protection seems best, for the reason that long confinement in warm weather is quite as disastrous as when the opposite extreme is protracted.

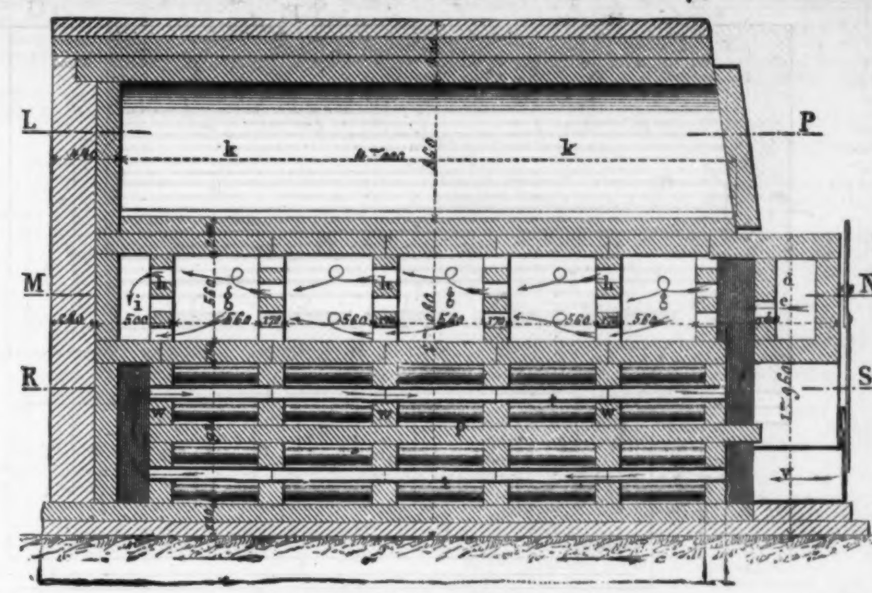
The reasons for this recommendation are obvious, because it is impracticable to carry out from a cellar and back again for a purifying flight, even once during a severe winter, a considerable number of hives; especially is this apparent when it is considered how capricious and subject to change winds, clouds, and mercury are liable to be; so that where everything promises the very best, and the bee-keeper feeling confident of an hour or two of fifty-degree weather and fair sunshine, undertakes the work of airing a dozen or twenty stocks, the work is scarcely begun ere clouds impenetrable overspread the sky, and his work must be reversed—or worse still, the flying bees are caught on the wing—thus issuing in unwonted numbers, caused by the disturbance and excitement incident to removal, and so perishing, work greater mischief than if left at rest.

Of course *one* flight, even for an hour during such a long confinement as they have been subject to the past winter, will suffice, *provided* the stocks are in otherwise healthy condition. But what plan is it *best* to adopt in order to most certainly secure the ends sought?

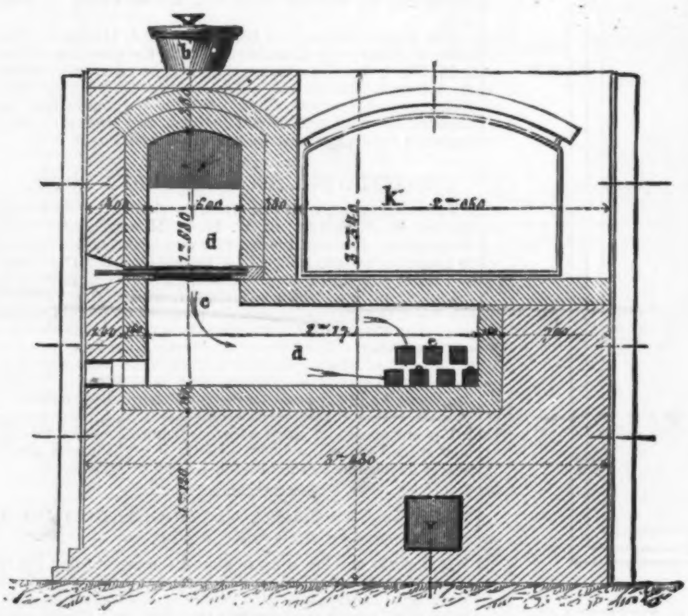
The answer to this inquiry is already indicated above, to wit: Out-door packing, either in chaff or double-wall hives during winter.—*Metcalf, in The Bee-keeper's Magazine.*



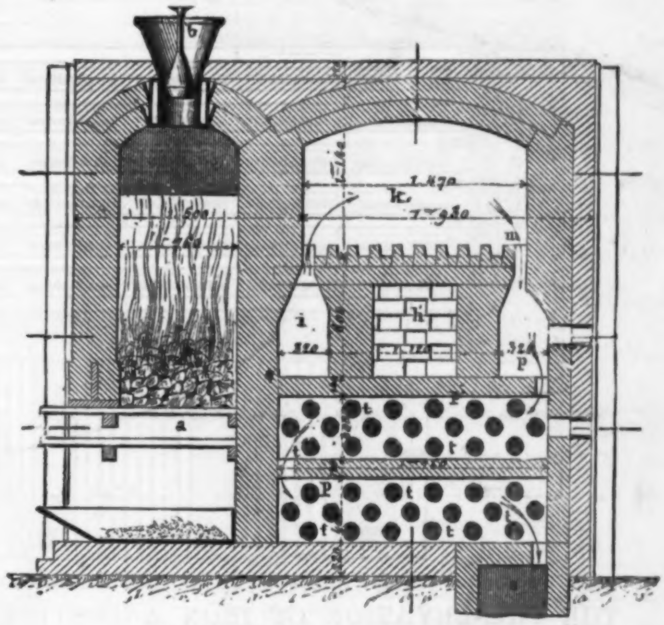
THE MUFFLE FASTENING.



LONGITUDINAL SECTION THROUGH A B.



TRANSVERSE SECTION THROUGH C D.



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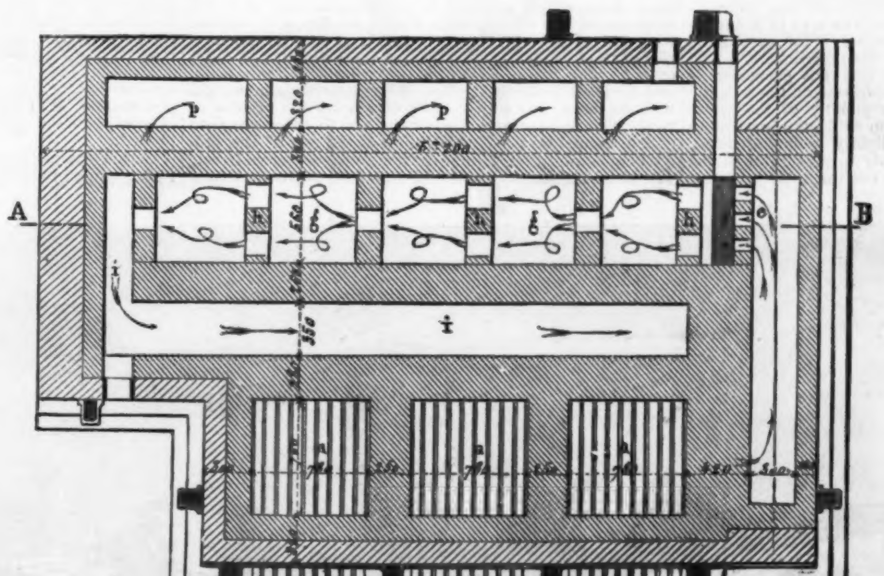


HORIZONTAL SECTION THROUGH M N.

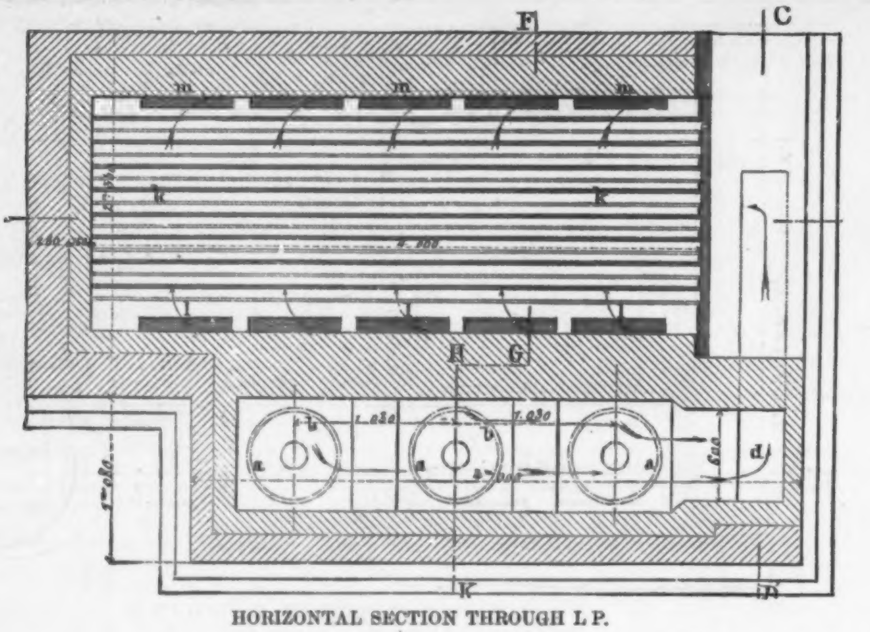
THE PRESERVATION OF IRON AND STEEL.—BOWER FURNACE.

latter precaution is explained by the fact that cast iron requires for the production of magnetic oxide a temperature of about 815° C., while other iron and steel need but 490° C.

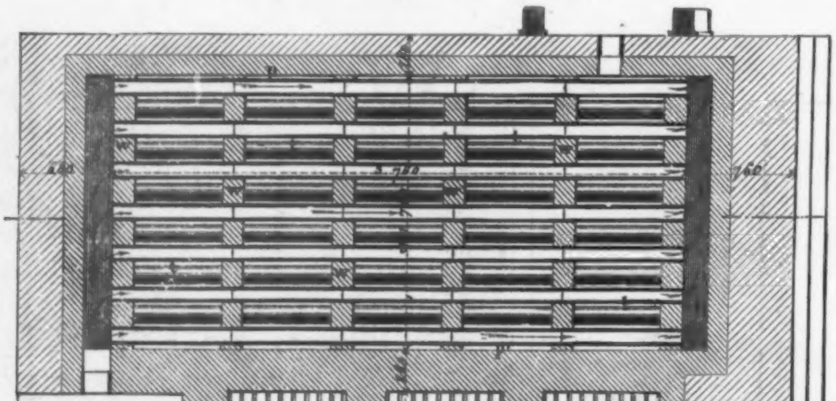
Objects thus prepared assume a very pleasing black color. A cast iron bracket and a bar of iron have, after this treatment, been tested by Mr. Tatlock by means of diluted sulphuric acid. At the end of two hours' immersion in water to which had been added one per cent. sulphuric acid, the bracket had lost four-thousandths of its weight only and showed no trace of rust. The bar under the same conditions lost only thirty-five ten-thousandths without rusting. Sir J. Whitworth has made some experiments in compressing the metal as thus prepared and has obtained most satisfactory results. Applied to riveted pieces, the treatment tightens the rivets and insures a complete protection against oxidation. Messrs. Dewrance & Co., of London, have prepared in this manner mouldings, gas and water pipes, door knobs, nails, etc., etc.

THE BOWER PROCESS.

The production of magnetic oxide by this process is obtained by operations which are somewhat more complicated. First, the objects are submitted to the action of heat and the products of the combustion of coal, mixed with a large quantity of air, and afterward to the action of carbonic oxide. There is thus, successively, oxidation and deoxidation. The details of the apparatus employed are clearly indicated in the cuts. The muffle, *k*, is made of refractory bricks. The gas generator, *a*, in which the carbonic oxide is prepared, differs little from that of Siemens; a conduit, *g*, with a regulating register, *c*, leads from the gas generator and carries the products of combustion into a succession of



HORIZONTAL SECTION THROUGH L P.



HORIZONTAL SECTION THROUGH R S.

THE PRESERVATION OF IRON AND STEEL.—BOWER FURNACE.

chambers where they mix before reaching the muffle through the passages, *i* and *l*. A regenerator, with clay tubes, *t*, around which circulates the heat which escapes in going to the chimney through the passages, *m*, serves for heating the cold air which enters through the draught flue, *v*. The production of carbonic oxide in this gas generator is explained by reducing action of red-hot coal on the carbonic acid produced by combustion in the vicinity of the grate. The pieces of metal, at first free from oxide, are brought to a cherry-red heat by means of a slightly reducing flame, which is obtained by allowing less air to pass through the flue, *v*, than is necessary to entirely transform the carbonic oxide into carbonic acid. This first operation of heating takes from a few minutes to an hour, according to the thickness of the pieces; after which the flue, *v*, is opened wide and an excess of air is allowed to enter until the interior of the furnace is perfectly clear and small flames only, enter *l*. This, the period of oxidation, lasts half an hour, and the result is the production of magnetic oxide in contact with the metal, and on it a layer of sesquioxide of iron or rust. The registers which allow the air to enter are then closed, as are also those which allow of the exit of the products of combustion, and the carbonic oxide is caused to act. The latter transforms the film of rust into magnetic oxide, and the operation is completed by alternately renewing the oxidation for a quarter of an hour and deoxidation for the same length of time, and prolonging this treatment for four or five hours according to the thickness to be given to the protective layer. With steel, excellent results are obtained by practicing for five or six hours alternate oxidations and deoxidations of a half hour each.

Specimens exhibited by Mr. Lindsay had received their protecting coating two years previously, and had remained exposed, dry or damp, for twelve or eighteen months in the open air, then for several months to moisture in wet hay; but in drying them no trace of rust was observable. The acidulated water test performed by Mr. Tatlock gave no appreciable loss of weight at the end of two hours, and there was an entire absence of rust when the pieces were wiped and dried in the air. Thus prepared, iron work assumes a beautiful gray tint. The application of the process has the advantage that it does not fill up the lines in ornamental articles, and that it perfectly preserves all artistic effects.

As far as we are permitted to judge from the reports of competent persons and from an experience of two years only, the Barff & Bower processes seem destined to replace galvanization, tinning, and enameling. When applied, as it can be at small expense, to the iron and steel employed in the construction of machines, ships, bridges, and edifices, it will give these a durability that could in general scarcely be expected in the unprotected metal. The muffles, it is true, are as yet too small to use, in connection with work of large size, but there is no obstacle in the way of increasing their dimensions. It is reasonable to believe that metal workers will not be slow to avail themselves of the results of the researches here pointed out.

EXPLANATION OF THE FIGURES.—*The Barff Furnace.*—A, Iron retort; B, Peepholes; C, Flues for admitting air; D, Furnace; E, Circulation flues; F, Peepholes; G, Series of registers; H, Gas escape; J, Superheating coil; K, Inlet steam pipe; L, Pipe leading the superheated steam to the muffle; M, Furnace of the coil, K; N, Flues; P, Peephole.

The Bower Furnace.—*a*, Gas generator; *b*, Hopper; *c*, Register; *d*, Flues; *h g*, Chamber in which the gases are mixed; *k*, Muffle; *l*, Aperture through which gas enters the muffle; *m*, Aperture through which it leaves the muffle; *t*, *p*, Recuperator; *v*, Air inlet. The products of combustion are denoted by double-feathered arrows, and the air which traverses the recuperator by single feathered ones.

TORPEDO PRACTICE—JUMPING A BOOM.

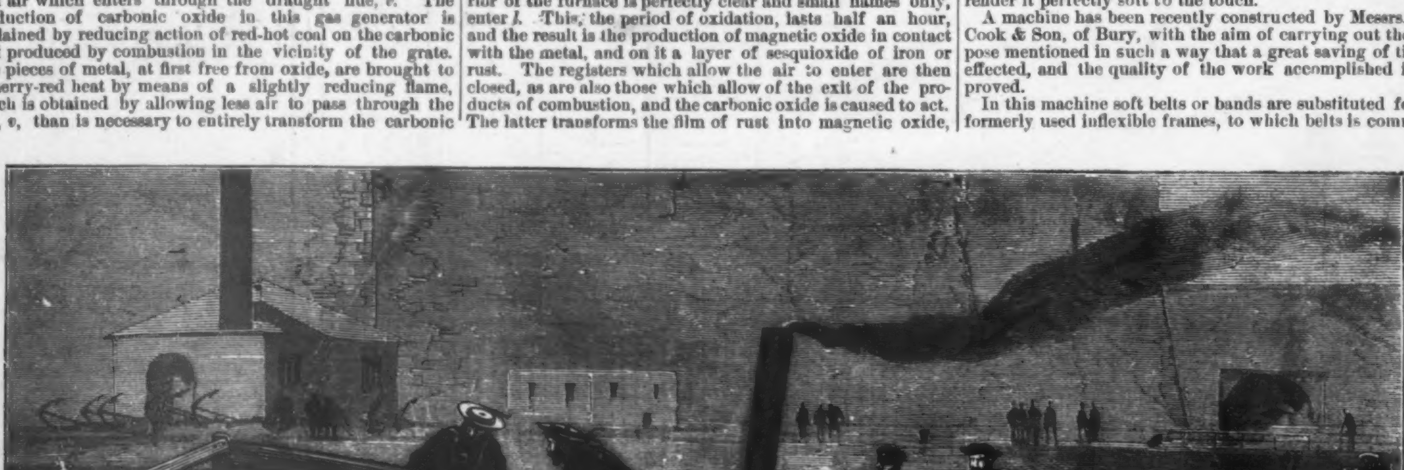
THIS engraving, which is from a sketch by Staff-Commander W. P. Haynes, of H. M. S. Monarch, needs little description. It is well known that one of the means adopted to protect a harbor, a fort, or a man-of-war from the swift and silent attacks of torpedo boats is the employment of "booms," or huge pieces of timber, which are set afloat in the water in order to impede the progress of possible invaders. The means of overcoming these obstacles is shown in our engraving. The bows of the torpedo boat are protected by a kind of timber shield; and then, an advance being made at full speed, the gallant little boat literally "jumps the boom," and proceeds on her mission of destruction. It is obvious that considerable skill is required for the successful performance of such a feat, it being necessary that the boat should strike the boom exactly at right angles, and as nearly as possible in the middle.—*London Graphic.*

MACHINE FOR SIZING, GLAZING, AND STRETCHING THE WARP.

MACHINES employed up to almost the present day for the purpose of sizing, glazing, and stretching the warp in the weaving of fabrics, consisted generally of a horizontal framework upon which the yarn was stretched and placed above a brush revolving at a great rate of speed until the softness and gloss considered necessary were given to the yarn. Another plan which is sometimes made use of, consists of suspending the yarn to an upright inflexible frame, and to pass it on all its surfaces between quickly revolving brushes in such a manner as to comb the fibers of the yarn so as to render it perfectly soft to the touch.

A machine has been recently constructed by Messrs. Saul Cook & Son, of Bury, with the aim of carrying out the purpose mentioned in such a way that a great saving of time is effected, and the quality of the work accomplished is improved.

In this machine soft belts or bands are substituted for the formerly used inflexible frames, to which belts is communi-



TORPEDO PRACTICE.

cated a to and fro motion between the brushes. These bands are caused to move slowly in one direction only, leading the yarn toward the middle of the revolving brushes, and pass all round the machine without any breakage in them, and, consequently, produce the work more quickly, and likewise more satisfactorily. The framework of this machine may be made of any wished-for length, and comprises two upright frames, one at each end, which are bound together by rails made of angle or of T iron.

On the outside of these uprights the ends of mechanical carriages are bolted, the same being in the form of V, which lead two right-handed cranks, to each of which two pulleys that play freely upon two tight screws placed in the upper cranks, and move up and down by means of a rod carrying two screws, one wormed to the right, and the other to the left, in such a way that they can be made to advance to each other or the reverse, according to the depth of the warp that is marked.

Around these pulleys and framework an endless belt formed of leather, hemp, or steel, is held in position by means of bolts or rivets; in the front are found a number of hooks or frames which support small wheels or pulleys that work in grooves at the upper part by means of rails; each hook is furnished with a spiral screw that gives the necessary tension to the warp while it is being acted upon by the brushes; the warp being held by the hooks upon the belts is then put in motion by two angle wheels fixed to the upright shafts at the end of the machine, and is then conducted between the revolving brushes in order to be polished and prepared. The brushes have, in addition to their revolving motion, a to and fro motion, so as to brush to any depth necessary. This can be regulated by a crank and a screw-nut in the usual manner.

After the warp has passed between the brushes and has been perfectly polished, it is taken off by the workman and suspended upon a slabbing frame to be ready for the drying room. This operation is one of the greatest importance, and up to the present time it has been done in the most reprehensible manner, for the following reasons:

A part of the warp having been removed from the brushing apparatus is then conveyed into a heated vessel, suspended to hooks screwed into fixed rails with cast-iron weights, or attached to bands fixed into the flooring of the vessel in order to give to it the necessary tension during the drying; this work having been done in a heated vessel in the midst of a suffocating odor of glazing is almost insupportable and acts prejudicially to the health of the workmen.

By means of an improved carriage this is completely avoided. This carriage is formed of a framework with two upright and two cross-rails. At the base of the two upright rails are formed two vessels in which the tension is produced by means of spiral screws fixed at the base, upon which the warp threads are suspended when they are lifted from the flexible belts upon the brushing apparatus, and are then attached by the hooks upon the spiral screws at the foot of the carriage, the required tension being given by this means. This framework or carriage, which is mounted upon wheels, is charged with the warp threads in the glazing chamber, which is cool, and when the carriage is filled it is conducted to the drying-chamber, and there it is allowed to remain some time in a heated atmosphere.—*Universal Engineer.*

JUTE BRUSSELS CARPETING.

A PATENT taken out by M. L'Heureux, Jr., rests upon the use of jute in the manufacture of so-called Wilton or Brussels carpeting, which hitherto has been made from wool. The application of jute for this purpose is facilitated by the preparation of a portion of jute yarn into what is called the "camel," and by the varying proportions of the number of the yarn made use of for the web and the main warp.

The jute yarn is fermented, for about ten or twelve hours, in a solution formed of 50 quarts of water and 1 lb. of alum, these proportions to be used for working about 90 lb. weight of thread.

After the jute has thus been cleared of the oil it may have gathered during its progress through the various processes of the spinning mill, that is to say, after it has been disinfected, it is dyed if required in the ordinary way; the jute is then sized with the following preparation: 1 lb. of starch dissolved in 90 quarts of water; the same weight of jute is submitted to the weight of sizing above named. The warp is prepared and dried in the customary manner.

The weft is made of jute yarn, No. 6.

The main warp of 10-twist flax yarn.

The "camel" of 6-twist jute.

The weaving is carried out on looms, such as are used in weaving velvet, and therefore it does not require special observations. Carpets made in this way can be produced at a reasonable price.—*Fils et Tissus.*

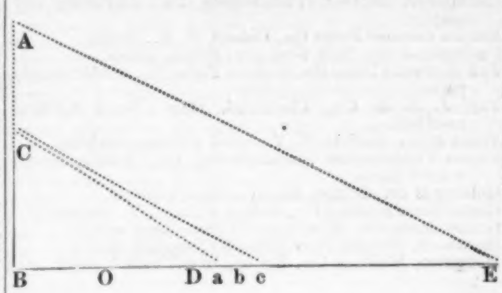
THE QUADRATURE OF THE CIRCLE.

THE geometrical construction for the quadrature of the circle given by Mr. MacAlpin, of Philadelphia, in the SCIENTIFIC AMERICAN SUPPLEMENT of May 28 (page 4494), is incorrect, not only in the sixth, as pretended, but already in the fourth decimal place. He says, also, that a 3 in the sixth place of decimals is "*only an imaginary quantity.*" No sound mathematician will agree to this, and even in practice it cannot be neglected. 400 feet may be little compared with the circumference of the earth, being its three-millionth part, but it is not an imaginary quantity; millionth parts are not imaginary, neither for the practical astronomer nor for the physicist who rarefies the air to one, two, or three millionths of the ordinary pressures, and finds differences of the utmost importance for electric illumination and for vacuum tubes. Modern chemistry shows how two or three atoms more or less in a molecule of a million may form a different compound, but it is unnecessary to give other illustrations.

It appears that Mr. MacAlpin has not worked out the calculation with a sufficient number of decimals, as he would have detected the error in the fourth decimal; his construction amounts to the formation of a triangle, of which the angle, C B F, is = 27° 35′ 51″, the correct angle of which the tangent is to the radius as 23 : 44. If we place H at the center of the circle, and draw the radius H C, we will have the angle C H F = 2 C B F = 55° 11′ 42″, and C H B = 180°—55° 11′ 42″ = 124° 48′ 18″. The shortest way to find B C is by the formula $BC^2 = CH^2 + BH^2 - 2\,BC \times CH \times \cos CHB$; as C H and B H are both radii it reduces the formula to $1 + 1 - 2 \cos CHB$, and as cos C H B = —cos 55° 11′ 42″, it is = —0·5708108. Multiplying this by 2, and adding 2 we obtain 3·1416142, etc. The true number being 3·1415926535, etc., the result is one fifty-thousandth part in excess.

I add here a simple approximate construction for the quadrature, which I published twenty years ago in a pamphlet on the quadrature of the circle, and which is correct to within half a millionth part of the diameter; it has the advantage not to require a scale to draw the lines needed.

GEOMETRICAL CONSTRUCTION FOR A VERY CLOSE APPROXIMATION TO THE CIRCUMFERENCE OF THE CIRCLE.



Let B D be the diameter of a circle; erect at its extremity, B, the perpendicular, B C, and make it equal to the radius; prolong B D, and make D*a* = *ab* = *bc* = one-fifth of the radius: draw *a* C and *c* C, and make B A = *a* C. If now we draw from A the line A E parallel to *c* C, B E will be only one half millionth part smaller than the number π.

Demonstration:

$$\text{As } BD \text{ is} = 1 \quad Ba = 1{\cdot}1 \quad \text{and } Bc = 1{\cdot}3$$

$$Ca^2 = Ba^2 + BC^2 = \tfrac{146}{100} \quad \text{and } Ca = \tfrac{\sqrt{146}}{10}$$

Next we have B C : B *c* :: B A : B E, or

$$\tfrac{1}{2} : \tfrac{13}{10} :: \tfrac{\sqrt{146}}{10} : B\,e$$

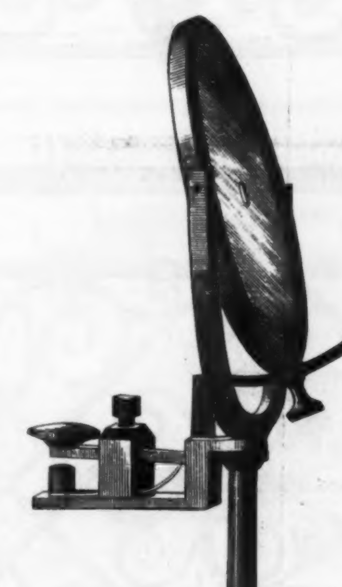
From which follows

$$BE = \tfrac{13\sqrt{146}}{50} = 13\sqrt{0{\cdot}0584} = \sqrt{9{\cdot}8696} = 3{\cdot}1415919, \text{ etc.}$$

P. H. VANDER WEYDE, M.D.

STONE'S IMPROVED HELIOGRAPH.

A VERY simple addition has recently been made to Major Macgregor's Ekowe Pocket Heliograph by Mr. W. Stone, the constructor of the instrument. In the original apparatus the movement of the mirror for producing the flashes was



effected by the direct action of the hand. Mr. Stone's improvement consists in adding a small key, by the depression of which the mirror is moved through a small angle, and which can be worked like an ordinary Morse key. This addition is shown by the figure, which is self-explanatory.

BUNGS.

THE bung is a homely device, lacking altogether the symmetry of an obelisk, and having little even of the grace which corks often possess. But its uses are of a most important kind, and wherever liquids are contained in casks or barrels, there must the bung be also.

It is almost impossible to estimate the quantity of bungs made and used annually, but the number is well up in the millions. They are made of wood well seasoned, and are cut by machinery which is patented. In no country are so many bungs made as in the United States, for nowhere else are the woods which are used so plentiful. Oak, hickory, spruce, and pine are among the varieties utilized, and the bung factories are scattered about the country in the neighborhoods where the woods used are found. By cutting the bungs before shipping, the cost of transporting the waste material is saved. A great many bungs for beer casks are sent both to Germany and England from this country, not because they are better, but because they are cheaper than those made abroad. Bungs are cut by peculiar and ingenious machinery which works against the grain of the wood, tapering the bung with the grain. In many cases the taper is made but slight in the cutting, and then the bung is submitted to a powerful compression to increase the taper.

Bungs of ale and beer barrels are of a standard size, measuring 1¾ inches; while bungs for oil barrels are 2 inches. Whisky-barrel bungs are used over and over again. Beer and oil-barrel bungs are always picked out, because hammering the staves to start the bungs is sure to injure the coating of the barrels.—*New York Sun.*

THE MELBOURNE EXHIBITION.

THE following are the awards to Americans for the Melbourne (Australia) Great Exhibition of 1880-81. The list is subject to correction:

FIRST DEGREE OF MERIT.

Abbot-Downing Co., Concord, N. H.; Concord buggies.
Adams, Peter, Buckland, Conn.; book printing paper.
Adams & Westlake Coal Oil Stove Co., Chicago, Ill.; coal oil stoves.
Aikin, Lambert & Co., New York city; gold pens and pencils
Albion Paper Co., Holyoke, Mass.; book printing and writing paper.
Allen & Ginter, Richmond, Va.; cut tobaccoes.
Allen & Ginter, Richmond, Va.; cigarettes.
American Bank Note Co., New York city; steel plate engraving.
Ames, Oliver & Sons, Corporation, North Easton, Mass.; shovels and spades.
American Watch Co., Waltham, Mass.; watches.
American Watch Co., Waltham, Mass.; chased and repousse work on watch cases.
Appleton, D. & Co., New York city; publications.
Appleton, D. & Co., New York city; printing.
Appleton, D. & Co., New York city; binding (book).
Beven Brothers' Manufacturing Co., East Hampton, Conn.; bells.
Bird, F. W., Hollingsworth & Co., East Walpole, Mass.; tarred hardware, cutlery, sandpaper, etc.
Blake (Geo. F.) Manufacturing Co., Boston and New York city; steam pump.
Boston Blower Co., Boston, Mass.; forge blower.
Bradley & Rulofson, San Francisco, Cal.; photographs.
Brooks, Ezra, Hartford, Conn.; automatic pump.
Brewster & Co., Broome street, New York city; buggy.
Brown, B. F. & Co., Boston, Mass.; leather dressing.
Bruce's (George) Son & Co., New York city; printing type.
Cameron, Bro. & Co., Richmond, Va.; manufactured tobacco.
Case Bros., South Manchester, Conn.; press paper.
Carter, Dinsmore & Co., Boston, Mass.; copying ink.
Carter, Dinsmore & Co., Boston, Mass.; black writing ink.
Carter, Dinsmore & Co., Boston, Mass.; colored writing ink.
Charter Oak Lawn Mower Co., Hartford, Conn.; lawn mowers.
Charter Oak Lawn Mower Co., Hartford, Conn.; pony lawn mowers.
Collins & Co., Hartford, Conn.; axes and edge tools.
Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn.; the "Baxter" portable steam engine.
Crane Bros., Westfield, Mass.; ledger paper.
Cummings, John & Co., Boston, Mass.; dressed boot upper leather.
Dare, C. W. F., New York city; velocipedes.
Davey, W. O., & Son, Jersey City, N. J.; tar mill boards.
Davis Sewing Machine Co., The, Watertown, N. Y.; family sewing machines.
Davis Sewing Machine Co., The, Watertown, N. Y.; hand sewing machines.
De Grau, Aymar & Co., New York city; oars and handspikes.
Disston, Henry & Sons, Philadelphia, Pa.; saws.
Dodds & Jackson, Dayton, Ohio; Davis lawn rake.
Douglas Manufacturing Co., Seymour, Conn.; carpenters' tools.
Douglas Axe Manufacturing Co., The, Boston, Mass.; axes and edge tools.
Douglas, W. & B., Middletown, Conn.; pumps.
Eagle Lock Co., Terryville, Conn.; locks for trunks, drawers, pianos, etc.
Edison, Prof. Thomas A., Menlo Park, N. J.; electric pen.
Everett & Small, Boston, Mass.; barrows.
Fairbanks & Co., New York city; letter balances.
Fairbanks & Co., New York city; weighbridges.
Fairbanks & Co., New York city; platform scales.
Fairbanks & Co., New York city; railway scales.
Field, A. & Sons, Taunton, Mass.; tacks and nails.
Frick & Co., Waynesboro, Pa.; "Eclipse" farm portable engine.
Forbes Lithographic Manufacturing Co., Boston, Mass.; albertype engravings.
Frothingham & Emory, New York city; fireproof safes.
Gatling Gun Co., Hartford, Conn.; one ten-barreled 45-inch Gatling gun.
Gally, Merrit, New York city; printing press.
Globe Nail Co., Boston, Mass.; horseshoe nails.
Hathaway, C. L. & Sons, Boston, Mass.; leather dressing and shoe blacking.
Herring & Co., New York city; burglar and fireproof safes.
Herring & Co., New York city; fireproof safes.
Hill, James R., & Co., Concord, N. H.; harnesses (single).
Hill, James R., & Co., Concord, N. H.; harnesses (double).
Hill, Warren, Boston, Mass.; ticket punches.
Holt, Hiram & Co., East Wilton, Me.; hay knives.
Holyoke Paper Co., Holyoke, Mass.; linen writing and bank note paper.
Houghton, Mifflin & Co., Boston, Mass.; publications.
Houghton, Mifflin & Co., Boston, Mass.; printing.
Howe Scale Co., The, Rutland, Vt.; platform scales.
Hoyt, J. B. & Co., New York city; leather belting.
Huston's Ship's Berth Co., The, Boston and New York city; self-leveling berth.
Ives, William A., New Haven, Conn.; wood boring tools.
Johnston Harvester Co., Brockport, N. Y.; harvester (reaper and mower).
Johnston Harvester Co., Brockport, N. Y.; mower.
Justi, H. D., Philadelphia, Pa.; artificial teeth.
Kimball, William S. & Co., Rochester, N. Y.; cut tobacco.
Kimball, William S. & Co., Rochester, N. Y.; cigarettes.
Kelly & Bartholomew, New York city; American Model Printer.
Lalance & Grosjean Manufacturing Co., New York city; enameled ware.
Lamb Knitting Machine Manufacturing Co., Chicopee Falls, Mass.; knitting machine.
Lockwood, Howard, New York city; publications.
Lockwood, Howard, New York city; printing.

Lockwood, Howard, New York city; electro printing.
Lowell, John A. & Co., Boston, Mass; steel plate engraving.
Mackinnon Pen Co., New York city; Mackinnon pens.
Magee, N., New York city; harnessmakers' tools.
Manning, Bowman & Co., West Meriden, Conn., "granite iron" ware.
Mason, Volney W. & Co., Providence, R. I.; friction clutch.
Matthews & Warren, Buffalo, N. Y.; color printing.
McCormick (The) Harvesting Machine Co., Chicago, Ill.; reaper and binder.
McCormick (The) Harvesting Machine Co., Chicago, Ill.; reaper and mower.
McCormick (The) Harvesting Machine Co., Chicago, Ill.; mower.
MacKellar, Smiths & Jordan, Philadelphia, Pa.; type foundry productions.
McLaughlin Bros., New York city; publications.
McLaughlin Bros., New York city; printing.
Merriam, G. & C., Springfield, Mass.; Webster's Dictionary.
Miller (D. K.) Lock Co., Philadelphia, Pa.; padlocks.
Morse Twist Drill and Machine Co., New Bedford, Mass.; taps, dies, screw plates, drills, and reamers.
Musselman, S. & Sons, Quakertown, Pa.; spokes and handles.
National Air Compressor and Rock Drill Co., New York city; air compressor and rock drill.
New Haven Folding Chair Co., New Haven, Conn.; invalid chairs.
New Haven Wheel Co., New Haven, Conn.; carriage and wagon wheels.
Osborne, C. S., Newark, R. I.; harnessmakers' tools.
Pacific Rubber Paint Co., San Francisco, Cal.; rubber paint.
Page, E. W. & Son, New York city; oars.
Page (W. H.) Wood Type Co., Norwich, Conn.; wood type and borders.
Pease, F. S., Buffalo, N. Y.; lubricating and illuminating oils.
Philadelphia College of Pharmacy, Philadelphia, Pa.; drugs.
Prang, L. & Co., Boston, Mass.; chromo lithographs as art publications.
Prang, L & Co., Boston, Mass.; chromo lithographs for educational purposes.
Pray, Joseph F., Boston, Mass.; sulky.
Putnam Nail Co., Neponset, Mass.; horse shoe nails.
Puzzoline Co., The, Boston, Mass.; mucilage and cement.
Rathbone, Sard & Co., Albany, N. Y.; cooking stoves.
Russell & Erwin Manufacturing Company, New Britain, Conn.; door trimmings.
Russell & Erwin Manufacturing Company, New Britain, Conn.; locks.
Russell & Erwin Manufacturing Company, New Britain, Conn.; carpenters' tools
St. Jose Fruit Packing Co., St. Jose, Cal; canned fruits.
Schieffelin, W. H. & Co., New York city; pharmaceutical preparations.
Scott Paper Co. (limited), Philadelphia, Pa.; manila paper.
Seabury & Johnson, New York city; medicinal and surgical plasters.
Simpson, Hall, Miller & Co., Wallingford, Conn., silver-plated ware.
Smith American Organ Co., Boston, Mass.; cabinet organs.
Smith & Wesson, Springfield, Mass.; revolvers.
Smith, William, Pittsburg, Pa.; national gas works.
Stanley Rule and Level Company, New Britain, Conn.; carpenters' tools.
Stephens & Woodin, San Francisco, Cal.; the "Althouse" windmill.
Sterling School Furniture Co., Sterling, Ill.; school desks.
Tuerk Bros. & Johnson, Chicago, Ill.; water motor.
Valentine & Co., New York city; varnishes.
Victor Sewing Machine Co., Middletown, Conn.; micrometer calipers and chucks.
Wade, H. D. & Co., New York city; black printing ink.
Wade, H. D. & Co., New York city; colored printing ink.
Ward, Henry A., Rochester, N. Y.; natural history collection.
Ward, Henry A., Rochester, N. Y.; rocks and minerals.
Warner, Wm. R. & Co., Philadelphia, Pa., sugar coated pills.
Warren, Moses & Co., Chicago, Ill.; educational publications.
Washburn & Moen Manufacturing Co., Worcester, Mass.; steel barb fencing.
Western Electric Manufacturing Co., Chicago and New York; telephones, hotel annunciators, etc.
Wheeler & Wilson Manufacturing Co., Bridgeport, Conn; heavy leather sewing machines.
Wheeler & Wilson Manufacturing Co., Bridgeport, Conn; family sewing machines.
Wheeler & Wilson Manufacturing Co., Bridgeport, Conn.; cloth manufacturing machines.
Whitney, A. & Sons, Philadelphia, Pa.; chilled cast wheels for railways.
White, Samuel S. (estate of), Philadelphia, Pa.; dental manufactures.
Whiton, M. F. & Co., Boston, Mass.; cordage.
Williams, Thomas C. & Co., Richmond, Va.; manufactured tobacco.
Winchester Repeating Arms Co., New Haven, Conn.; rifles and carbines.
Wood, Walter A., Hoosick Falls, N. Y.; reaper and mower.
Wood, Walter A., Hoosick Falls, N. Y.; reaper and mower.
Yale Lock Manufacturing Co., Stamford, Conn.; locks for post offices and other purposes.
Young, Ladd & Coffin, New York city; Lundborg's perfumes.

SECOND DEGREE OF MERIT.

Abbot-Downing Co., Concord, N. H.; single open buggies.
Albion Paper Co., Holyoke, Mass.; writing paper.
Ballard, Stephen & Co., New York city; leather belting.
Bancroft, A. L. & Co., San Francisco, Cal.; lithographic printing.
Barker, J. S., Albany, N. Y.; caligraphy.
Barnard, Henry, Hartford, Conn.; educational publications.
Barrie, George, Philadelphia, Pa.; illustrated books.
Belding Bros., Rockville, Conn.; sewing silk.
Burnett, Joseph & Co., Boston, Mass.; flavoring extracts.
Chadborn & Coldwell Manufacturing Company, Newburg, N. Y.; lawn mowers.
Cleveland Steam Gauge Co., Cleveland, Ohio; Watson's portable forge.
Colt's Patent Firearms Manufacturing Co., Hartford, Conn.; shot guns.
Currier & Ives, New York city; colored lithographs.
Dickey, Albert P., Racine, Wis.; fanning mills.
Dighton, Furnace Co., North Dighton, Mass.; stoves and ranges.
Dunbar, Hobart & Whidden, South Abington Station, Mass.; tacks and nails.
Eastman & Brother, Philadelphia, Pa.; perfumery and soaps.
Empire Portable Forge Co., Cohoes, N. Y.; forges.
Fairbanks & Co, New York city; counter scales.
Fall Mountain Paper Co., Bellows Falls, Vt.; double manila paper.
Fay, J. A. & Co., Cincinnati, Ohio; wood working machines.
Frank & Co., Buffalo, N. Y.; wood working machines.
Forbes Lithographic Manufacturing Co., Boston, Mass.; colored labels.
Golding & Co., Boston, Mass.; printing presses.
Gould Manufacturing Co., Seneca Falls, N. Y.; pumps.
Grilley Screw Co., New Haven, Conn.; metal screws.
Hartshorn, Stewart, New York city; window shades.
Houghton, Mifflin & Co., Boston, Mass.; book binding.
Purdy & Huntington Co., Limited, New York city; celluloid jewelry.
Randolph & English, Richmond, Va.; paper boxes for druggists' use.
Remington, E. & Sons, Ilion, N. Y.; type writer.
Rowley & Hermance, Williamsport, Pa.; woodworking machinery.
Rumsey & Co., Seneca Falls, N. Y.; pumps.
Shriver & Co. (T.), New York city; copying press.
Silver Lake Co., Boston, Mass.; cordage.
Spurr, Charles W., Boston, Mass.; veneers.
Taylor & Farley Organ Co., Worcester, Mass.; cabinet organs.
Tillotson, L. G. & Co., New York city; railway supplies.
Tuttle & Co., San Francisco, Cal.; photographs.
Wamsutta Mills, New Bedford, Mass.; cotton goods.
Warren, Moses & Co., Chicago, Ill.; educational publications.
Watt & Call, Richmond, Va.; plows.
Wheeler & Wilson Manufacturing Co., Bridgeport, Conn.; hand sewing machines.
Whiton, M. F. & Co., Boston, Mass.; cotton duck.

ENCLOSURE OF THE GOETHE MONUMENT, BERLIN AND BALCONY RAILING, DESIGNED BY KAISER AND VON GROSSHEIM, ARCHITECTS, EXECUTED BY E. PULS, ART-METAL-WORKER IN BERLIN.—*From The Workshop.*

Ithaca Calendar Clock Co., Ithaca, N. Y.; calendar clocks.
Johnson, Charles E., Philadelphia, Pa.; black printing ink.
Johnson, Charles E., Philadelphia, Pa.; colored printing ink.
Johnson, Clark & Co., New York city; family sewing machines.
Johnson, Clark & Co., New York city; hand sewing machines.
Kuntz, William F. & Co., New York city; bottled lager beer.
Lawson & Brenizer, Philadelphia, Pa.; hay, manure, spading forks, etc.
Morris, Wheeler & Co., Philadelphia, Pa.; nails.
Munsell, Rollo & Co. New York city; stoves.
North, O. B. & Co., New Haven, Conn.; adjustable carriage top.
Parker Brothers, Meriden, Conn.; shot guns.
Peloubet & Co., New York city; cabinet organs.
Pennsylvania Lawn Mower Co., Philadelphia, Pa.; lawn mower.
Williams, Stillings & Co., New York city; Russell's binder.
Young, Ladd & Coffin, New York city; cologne.

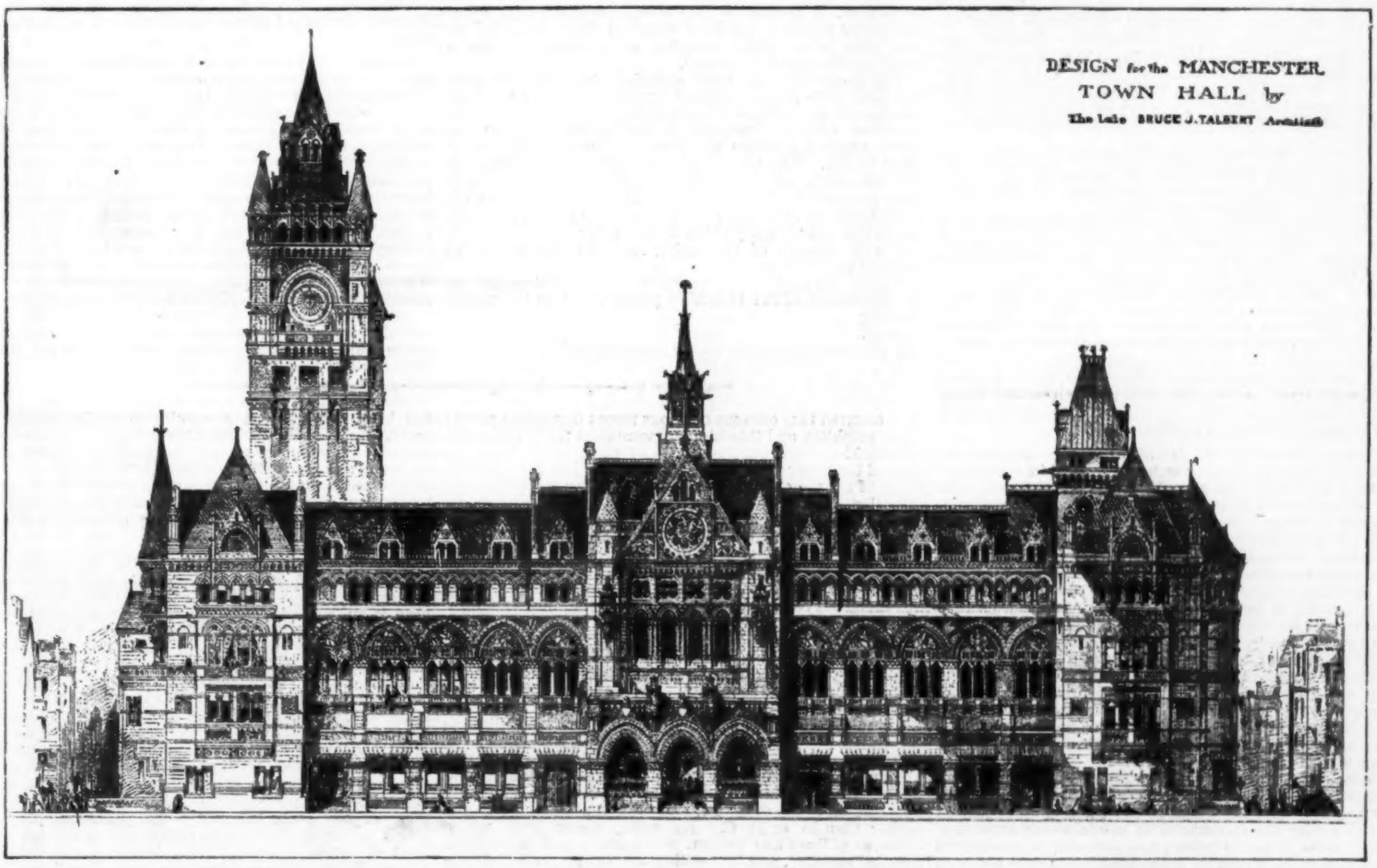
THIRD DEGREE OF MERIT.

Bancroft, A. L. & Co., San Francisco, Cal.; colored label printing.
Bane, Thomas & Co., Chicago, Ill.; school desk.
Burnett, Joseph & Co., Boston, Mass.; chemical products.
Cummings, John & Co., Boston, Mass.; waxed and russet calfskin.
Currier & Ives, New York city; lithographic printing.
Gill, Thomas, New York city; borax soap.
Ives, Hobart B., New Haven, Conn.; door bolts.
Juvet & Co., Canajoharie, N. Y.; celestial and relative globes.
Lovegrove & Co., Philadelphia, Pa.; steam engine.
Mills, F. B., San Francisco, Cal.; caligraphy.
Milton, Bradley & Co., Springfield, Mass.; toys.

Osborne, D. M. & Co., Auburn, New York; reaper and binder.
Page Belting Co., Concord, N. H.; leather belting.
Palm & Fechteler, New York city; silk transfer ornaments.
Peabody, Henry W. & Co., Boston, Mass.; pine wood doors.
Peddie, T. B. & Co., Newark, N. J.; trunks and bags.
Rogers, John, New York city; statuary.
Rumpp, C. F., Philadelphia, Pa.; leather goods.
Santifaller, J. B., New York city; wood carvings.
Schultz, Southwick & Co., New York city; sole leather.
Stafford, Samuel S., New York city; copying ink.
Stafford, Samuel S., New York city; black writing ink.
Stafford, Samuel S., New York city; colored writing ink.
Williams Brothers, Ithaca, N. Y.; farm engine.
Williams Brothers, Ithaca, N. Y.; horse hay rake.
Winship, William W., Boston, Mass.; trunks.
Woven Wire Mattress Co., Hartford, Conn.; wire mattresses.

OTHER AWARDS.

Bradley & Hubbard Manufacturing Co., West Meriden, Conn.; clocks.
Demorest, Mme., New York city; paper patterns.
Hobbs (J. H.), Brockunier & Co., Wheeling, W. Va.; glassware.
India Rubber Combination Co., New York city; rubber goods.
Juvet & Co., Canajoharie, N. Y.; cosmographic block.
Mayer, Strouse & Co., New Haven, Conn.; corsets.
McLaughlin Bros., New York city; toy books and games.
New Haven Folding Chair Co., New Haven, Conn.; folding chairs.
New York Plough Co., The, New York city; corn sheller.
Sander, Enno Ph. D., St. Louis, Miss.; veterinary surgeon's chest.
Suppler Needle Co., Philadelphia, Pa.; needles.
Vail, E. W., Worcester, Mass.; folding chairs.
West Haven Buckle Co., West Haven, Conn.; buckles.
Weber, Ph. C., Philadelphia, Pa.; painting.
Perkins Institute and Massachusetts School for the Blind, South Boston, Mass.; fancy work and embossed books.
Victor Noiseless Slate Co., Chicago, Ill.; slates.
Wakefield Rattan Co., Boston, Mass.; rattan chairs.



SUGGESTIONS IN ARCHITECTURE.—DESIGN FOR TOWN HALL, MANCHESTER.

DESIGN FOR THE MANCHESTER TOWN HALL.

AMONG our illustrations, we have reproduced Mr. Bruce J. Talbert's drawing of his design for the Manchester Town Hall, and although, of course, all immediate interest in that competition has long since passed away, an illustration of this design cannot fail to be appreciated. We have chosen it from the late Mr. Talbert's collection of drawings as being about the only strictly architectural design of importance which he has left in a completed form; and, certainly, it is a composition quite worthy of his reputation.—*Building News.*

THE ADULTERATION OF OLIVE OIL.*

By MICHAEL CONROY, F.C.S.

THE subject of this communication suggested itself to me by the following paragraph which appeared in the *Pharmaceutical Journal* of March 26 last, under the heading of "The Month:"

"Buyers of olive oil will probably find it necessary ere long to carefully examine that imported from Italy. Cottonseed oil is said by the United States Consul at Naples to have found its way into the remotest mountain villages in Italy, where the sole production is olive oil, not merely as a substitute for, but as an adulterant of, olive oil. It has also found its way into Russia, one of the chief outlets for Italian olive oil. As the cotton-seed oil can be sold in Italy at half the value of olive oil, the inducement to use it as an adulterant is very great. The Government of Italy is endeavoring to impose a heavy tax on cotton-seed oil, with the view of protecting the production of olive oil. It is obvious, however, that a good test to detect the presence of small quantities of cotton-seed oil would be a better preventive to adulteration. Cotton-seed oil is a drying oil, and if added in equal parts to olive oil its drying nature is still evidenced by its leaving sticky streaks near the mouth of the bottle when droppings become exposed to the air."

From inquiries which I have made, I learn that very large quantities of cotton-seed oil are shipped from this port (Liverpool), for Italy; but my informants say that most of it is used by the poorer Italians for cooking and other domestic purposes, instead of the more valuable production of the olive, and that it is also chiefly used for tinning sardines. That much of it is thus used there can be no reasonable doubt, but it is nevertheless well known that it is largely used for the adulteration of olive oil, and unfortunately the published tests for its detection are very defective. In reference to these tests we find the following in Fluckiger and Hambury's valuable "Pharmacographia," published in 1874:

"So far as our experience goes, the processes hitherto recommended for testing olive oil are only available in cases where the adulteration is considerable, and are quite insufficient for discovering a small mixture of other oils. How little they are appreciated may be inferred from the fact that the Chamber of Commerce of Nice has recently offered a reward of 15,000 francs (£600) for a simple and easy process for making evident an admixture with olive oil of 5 per cent., at least, of any seed oil."

It is for the purpose of practically showing you a simple and an easy test that will detect the presence of 5 per cent. of cotton-seed, or any other seed oil, that I have the honor of bringing the matter under your notice this evening, but before doing so we will take a cursory glance at those tests most relied on at present.

M. Lefebvre's method consists in taking advantage of the densities of the various oils, and for that purpose he constructed an oleometer, on the stem of which were inscribed the densities of the various fat oils. It is obvious that this method cannot be either delicate or reliable, for the reason that there is not sufficient variation in the densities of fat oils to enable them to be detected in mixtures. Moreover it is even doubtful if the densities of oils from any given source are constant. But granting that they are constant, it would be a very easy matter to make mixtures to suit any required density; hence this method is of little or no use.

M. Maumené's plan consists in noting the amount of heat evolved on mixing concentrated sulphuric acid with the oils; the drying oils giving off a much greater amount of heat than olive oil under the same circumstances. This is a better method than the preceding one, but it is not sufficiently delicate.

M. Heydenreich and Penot also propose the use of sulphuric acid; but they distinguish the various oils by the colors produced by the action of the acid. Thus olive oil produces a deep yellow tint, becoming greenish by degrees; colza oil, a greenish blue; poppy oil, a pale yellow tint, with dirty gray outline; hempseed oil, a deep emerald tint, and linseed oil becomes brownish-red, changing to black brown. The test is applied by adding one drop of strong sulphuric acid to 8 or 10 drops of the oil, placed on a piece of white glass, resting on a sheet of white paper. My experience is that these reactions do not always occur, as stated, in the genuine oils, and that for the detection of adulteration the method is utterly useless.

The favorite method is, however, that proposed by M. Poutet. It consists in heating up the oil with one-twelfth of its weight of solution of nitrate of mercury. The nitrous acid or nitric peroxide evolved from this converts the oleine of olive oil into elaidin, causing the oil, if pure, to become solid in a couple of hours, while the drying oils remain liquid. It will be seen from this that olive oil adulterated with any of the drying oils will not set as hard nor as quickly as genuine olive oil, and that the consistency to which the sample sets, and the time occupied in setting, somewhat roughly indicate the amount of adulteration. A modification of this process is to use nitric acid instead of the solution of nitrate of mercury, and I believe that this plan is practiced by many oil merchants. The *modus operandi* is to mix half a fluid drachm of strong nitric acid with about 5 fluid drachms of the oil in a bottle of 1 fluid ounce capacity, and to shake up briskly, and put in a cool place for a few hours, when the color and consistency are noted. The results are somewhat similar to those obtained by the nitrate of mercury test. These two tests are, in my opinion, the best published; but they are not satisfactory, inasmuch as it is extremely difficult to judge of the consistency of the results obtained, and, so far as my experience goes, they are useless for samples containing less than 10 or 15 per cent. of seed oils.

The plan which I recommend as more suitable for the purpose is based on an improved method of applying this last test; but instead of being guided by the consistency, I am guided by the color produced. The test is applied as follows: Mix thoroughly 1 part of strong nitric acid (sp. gr. 1·42) with 9 parts of the oil to be tested, and pour the mixture into a white porcelain dish capable of holding at least 10 times the quantity. Apply heat gently, until the action between the acid and the oil is fairly set up, then remove the source of heat and stir well with a glass rod until the action is over.

Pure olive oil thus treated and allowed to cool sets into a pale straw-colored hard mass in an hour or two, while cottonseed and other seed oils assume a deep orange-red color, and do not set like olive oil.

In hot weather it is necessary to artificially cool the sample so as to promote the setting; but to a practiced eye the setting is quite unnecessary, the color being sufficiently distinct without.

It will be seen that the delicacy of this test depends upon the great contrast in color exhibited between genuine olive and seed oils, when operated on as described, so that an admixture of 5 per cent. of any seed oil with olive oil is readily detected. Another important feature in this, and possessed by no other test, is the accuracy with which the approximate amount of admixture may be ascertained; and to practically show this feature, I have on the table a sample of genuine olive, and one of cotton-seed, and seven other samples, containing respectively 5, 10, 15, 20, 30, 40, and 50 per cent. of cotton-seed oil, which have been treated by this method, and I venture to say that not one here will experience any difficulty in picking out the various samples, the gradation in color being so uniform, and I may also add that it is constant. It therefore follows that, if an oil be found to set of a different color to that of a sample of genuine olive, the approximate amount of adulteration can be found by making and operating on a few mixtures containing a known percentage of the adulterant. A little experience in working the test will wonderfully assist in determining the percentage of admixture in any sample, but in all cases I would recommend that the test be performed in conjunction with a sample of genuine olive. The quantities which I have been in the habit of using are, half a fluid drachm of nitric acid and 9½ fluid drachms of oil, and having used the test for about three years, I can confidently recommend it as thoroughly reliable and constant when carefully carried out. The heat should be removed as soon as the action has fairly started, and the mixture should be kept well stirred until the action is over. Should too much heat be applied, the action becomes violent and unmanageable, and some of the mixture will spurt out of the dish. This spurting, however, may be prevented by placing a plate or other flat body over the dish. The results obtained are never as good when the action is so violent as to cause spurting

* Read at a meeting of the Liverpool Chemists' Association, April 28, 1881.

BRIEF REVIEW OF THE MOST IMPORTANT CHANGES IN THE INDUSTRIAL APPLICATIONS OF CHEMISTRY WITHIN THE LAST FEW YEARS.

By J. W. Mallet.

Materials Employed in Washing.

Soap.—The consumption in the manufacture of soap of foreign fats, for the most part the product of hot countries, has very greatly increased, palm oil and cocoanut oil being of first-class importance, while to a less extent mafurra tallow, cotton-seed oil, peanut oil, and other such materials have been applied to this use. Large additional supplies of fat have come to be regularly obtained by extraction with carbon disulphide, and of late still better with light petroleum spirit, from the "marc" of olive pressing, from colza, cotton, and other seed cakes, from bones, slaughter-house refuse, cotton waste, etc., as has been noticed in a previous portion of this report, and these have in great measure fallen into the hands of the soap-boiler. In some respects, however, the most valuable of modern additions to his resources has been the "red oil" or crude oleic acid turned out in great quantity in pressing the solid fatty acids, palmitic and stearic, used in the manufacture of candles. The facility with which this free acid undergoes saponification, in comparison with the corresponding glyceride, is alone sufficient to distinguish it.

The chief feature in the supply of alkali has been the very general introduction of ready-made caustic soda, as contrasted with the old practice of causticizing the carbonate in the soap factory itself immediately before using it.

Of secondary materials introduced, a large proportion represent simply the fraudulent application of ingenuity in debasing the product with useless solid matter, or with water in excessive quantity, while preserving the appearance of good soap. Most of the so-called "silicated" soaps, and those with which aluminum hydrate, potato starch, and bone gelatine, with or without calcium phosphate, have been blended in quantity, are illustrations of this lowering of the standard of honest manufacture. The use of carnauba wax as the means of enabling soap to take up petroleum, while retaining the property of complete solubility in water, exhibits a curious case of modified behavior in relation to solvents. Some few of the additions made to ordinary soap for special uses have real value, as for instance the glycerine employed in the bland soap, made in great perfection by Price's Patent Candle Co., for toilet use upon delicate skin, and the carbolic acid soap intended for medical and sanitary applications.

Greater care than was formerly common is given to the neutrality of soaps manufactured for industrial uses, as by bleachers, dyers, etc., avoiding excess either of alkali or of free fatty acid, particularly the former.

In the actual process of soap boiling, heating by means of steam has come more and more into use, replacing the use of open fires. The proposal to bring about saponification under increased pressure in close vessels, though sound in point of general principle, has not been practically applied on account of various inconveniences in detail which it involves. The most novel suggestion, that of Mr. Whitelaw in 1875, to make soap directly from common salt by heating together a neutral fat, excess of common salt, ammonia and water, raising the temperature to about 150° C. in a closed vessel, although it has not established itself in successful practical application, seems deserving of more careful study than apparently it has yet received.

Accessory Materials used in Washing.—In relation to Clark's process for softening water to be used in washing, it has been shown by experiments made upon the large scale that magnesia-hard water, containing magnesium carbonate dissolved by excess of carbonic acid, may be purified by means of calcium hydrate as completely and easily as water which owes its hardness to calcium carbonate. Clear lime-water proved much more satisfactory in producing precipitation than milk of lime, and from three to five hours sufficed for the settling of the precipitate, leaving the water clear.

Among alkaline materials adapted to increase the cleansing power of water, either with or without soap, the most useful which have been brought forward are borax and sodium silicate (soluble glass). The former has become generally available since California has furnished such an abundant supply, and borax soap is manufactured with which the salt is already incorporated. Soluble glass has been employed to some extent in the industrial preparation of new textile fabrics.

The addition of gum to the starch jelly used in giving stiffness to washed clothing has long been practiced with a view to improving the gloss of the surface, especially in order to render the appearance of new clothing attractive. There is some reason to believe that dextrine is substituted for natural gum, although such substitution does not seem to have been publicly noticed. If this be not practiced, it would be well that the efficacy of dextrine for this purpose should be tried, since it is obtainable of excellent color and at low price.

As the "bluing" intended to neutralize to the eye any yellowish tint remaining from imperfect washing or bleaching of cloth, ultramarine and soluble Prussian blue have to a large extent taken the place of the indigo and smalt formerly in general use.

Of materials capable of rendering vegetable fabrics non-inflammable, retarding greatly their combustibility and preventing their ready ignition by contact with flame, sodium tungstate is best known and has come into practical use upon a moderate scale. Other substances have, however, been employed with some success, and but recently a premium has been awarded by the French "Societe d'Encouragement pour l'Industrie Nationale" for a mixture to be thus applied, consisting of ammonium sulphate 8 parts, ammonium carbonate 2, boracic acid 3, borax 2, and starch 2, to be dissolved in 100 parts of water.

Appendix to Washing.

Perfumes.—Many new perfumes of natural origin have from time to time been brought into public notice within the last few years, but a large proportion of these fail to establish themselves in permanent use. Among the more interesting and valuable of such materials may be mentioned: Champa or Champaca attur (*Michelia champaca*), from India; Grass oil (*Andropogon ivaracusa*), from India; Khuskhus oil (*Anatherum muricatum*), from India; Ylang-ylang oil (*Artabotrys odoratissima*), from Philippine Isles; Sampaguita attur (*gen. et sp.?*), from Philippine Isles; Eucalyptus oils (*Eucalyptus*, of several species), from Australia; Myall wood (*Acacia pendula*), from New South Wales; Toronjil oil (*Cedronella mexicana*), from Mexico; Lignaloes oil (*Amyris lignaloes*), from Mexico; Licoria wood (*Licoria odorata*), from Cayenne.

The chief novelties in regard to methods for the extraction of neutral perfumes have been the substitution of paraffine for ordinary bland fats in the process of "*enfleurage*," thus avoiding the disagreeable consequences of the rancidity which the latter suffer sooner or later, and the employment of light petroleum spirit as an energetic solvent, which may readily be gotten rid of by evaporation at very low temperature after it has served the purpose of extracting the delicate perfumes of such flowers as the violet, tuberose, jasmine, etc., which will not bear the temperature necessary for distillation with water. Other solvents of similar volatile character have been used; one of the last of these which has been proposed is methyl chloride, as made by Camille Vincent from the vinasse of beet-root molasses distillation.

The rapid progress of modern organic chemistry has contributed sundry artificial perfumes, although not in as great number and variety as the artificial dye-stuffs. Among the more prominent of such perfumes are "Mirbane essence," or nitrobenzene, simulating, though not perfectly, the odor of bitter almond; the real oil of bitter almonds, or benzoic aldehyde, identical in character and composition with the natural oil, but made from coal-tar toluene; "Niobe essence," or methyl benzoate, artificially prepared with artificial benzoic acid; oil of winter-green, obtainable on a large scale and cheaply by means of Kolbe's synthetically made salicylic acid; artificial coumarine by Perkins' beautiful synthesis; and vanilline by the equally admirable process worked out by Tiemann and Haarmann.

Materials for Writing, Printing, Etc.

Paper.—The most remarkable feature in the recent history of the manufacture of paper has been the substitution for rags, to an enormous extent, of a great variety of crude vegetable fibrous materials. Chief among these have been esparto grass* or "alfa" (a sedge from Spain and northern Africa), straw, maize leaves (with which excellent results have been obtained at Vienna), and soft wood of various trees. Bamboo† and sugar-cane or sorghum "*bagasse*," although affording coarse fiber, admit of being successfully used, and are obtainable in immense quantity; they have not as yet been actually employed to any great extent. Short, weak fiber, fit mainly to be worked up along with other and better material, has been obtained from pressed beet-root pulp of the sugar factories, cotton-seed hulls, and a great number of other sources.

The employment of these materials, in which the pure vegetable fibre is incrusted and cemented together by other substances, has demanded the general application of a disintegrating process, consisting in heating with alkaline lye, often under a pressure of three or four atmospheres in close vessels. The use of the acid sulphite of sodium or calcium, instead of caustic soda, for this purpose has recently been patented by Mitscherlich, and it is claimed that the substitution produces fiber much superior in length, strength, and whiteness to that yielded by the older process, bleaching with chloride of lime being rendered unnecessary or reduced to a minimum.

There have been sundry improvements in pulping engines, in the details of the bleaching process, and in the paper-making machinery proper, but these either involve no changes of radical importance, or belong to the domain of the mechanical engineer rather than the chemist.

In getting rid of the residual chlorine after bleaching, the tendency has for some years been in the direction of using "antichlors" more sparingly, but washing more thoroughly. It is asserted that editions of books issued during the period when sulphites and thiosulphates were most freely employed as antichlors show manifest signs of more rapid deterioration of the paper than either those of the last few years or those of the period before chlorine bleaching was practiced. The liberation of free sulphur in a state of extreme subdivision from sodium thiosulphate (old hyposulphite) constitutes a special objection to it. It has been proposed to use in preference to these salts a very weak solution of ammonia.

The theory of resin-sizing of paper has been not long since carefully examined by Wurster and Conradin, and the most advantageous conditions studied for precipitating smoothly and in a very fine state of division the free acids of the resin soap by means of aluminum sulphate. The same chemists advocate the precipitation in the pulp of barium sulphate by the reaction of barium chloride on the sodium sulphate formed in the precipitation of the resin soap. The addition of a little glycerine in connection with the sizing has been found to give a special softness and pliability to the paper.

Of special modifications of paper introduced in comparatively recent times, the most valuable is "parchment paper," made by immersion for a short time in sulphuric acid diluted to 59° or 60° B., and kept at a temperature not higher than 10° or 12° C. By using paper from mixed fibers, as of linen and cotton, which are acted upon with unequal rapidity, and by limiting the extent to which the change is allowed to penetrate beneath the surface of thick paper, products combining horny hardness with flexibility in various different degrees are manufactured. The thin, delicate Japanese paper (chiefly from Kodzu, *Broussonetia papyrifera*, and Kuwa, *Morus alba*), intended for transient use in the form of napkins, handkerchiefs, curtains, etc., and the Japanese waterproof paper in imitation of leather, prepared by treatment with successive coats of a drying oil, have both been reproduced in western hands with a fair degree of success, though not as yet upon a very large scale. An "incombustible" paper has lately been described as made in France by mixing 2 parts of paper pulp with 1 part of asbestos, soaking the mass with a solution of alum and common salt, making into paper on the ordinary form of machine, treating the surface with a solution of shellac, passing between rollers and cutting into sheets. It is said that if this paper be written upon with common ink (from nut-galls and copperas), the paper and writing are not destroyed by exposure to fire, *i. e.*, doubtless, not so far destroyed as to prevent the possibility of deciphering the writing. At the time of the great Boston fire, a few years ago, it was observed that heavily "clayed" paper most resisted destruction, while pencil marks were more generally found legible than those made with ink.

Ink.—The chief novelty in the manufacture of writing ink has been the introduction of various colored inks—particularly violet; to a less extent red, blue, and green—prepared with solutions of the coal-tar colors. These have the advantage of flowing freely from the pen and drying quickly, but they are deficient in durability, being easily destroyed in greater or less degree by light, heat, and age. The best is doubtless that made from soluble aniline black, which material can readily be carried about in the dry state and dissolved in a few moments for use, thus representing the most convenient form of "portable ink." The comparatively moderate price at which vanadium compounds can now be had admits of the revival of Berzelius's suggestion of half a century ago, to use as ink the very dark colored fluid obtained by mixing ammonium vanadate solution with infusion of nut-galls; the product was highly recommended by him on the score of color, fluidity, and indelibility. Among somewhat recent modifications of common writing ink from galls and copperas may be mentioned the addition of salicylic acid as a preventive of moulding, and the use of glycerine in copying ink to prevent rapid drying of the writing.

Among new materials for the manufacture of printing ink also, the coal-tar colors have played a principal part. Brilliant effects have been cheaply obtained by means of them. The most interesting form in which they have been applied is that of fatty acid compounds of the color bases, readily miscible with linseed oil, and well adapted to the production of inks for chromo-lithography. In the preparation of the higher grades of ordinary black printing ink there has been no more important improvement than the introduction of the very fine lamp-black, so-called "diamond black," made by the smothered combustion of natural hydrocarbon gas (chiefly methane) in the petroleum region of Ohio. The purity of the carbon so obtained, its extremely fine subdivision, smoothness, and intense jetty black appearance, render it fit for the production of the very best printing and lithographic ink.

As "indelible" ink for marking clothing, carbon inks of the same general character as those used by printers have come largely into use in the United States instead of the nitrate of silver preparations; but the most valuable novelty in this direction has been the "jetoline" brought foward a few years ago, intended to develop insoluble aniline black upon the cloth to be marked, by writing with a mixture, prepared in small quantity immediately beforehand, of the two liquids furnished, one of these being a solution of an aniline salt and the other one of a vanadium compound, with the necessary amount of potassium chlorate or other oxidizing agent.

Mucilage.—For mucilage to be used in uniting surfaces of paper, the cheap and nearly colorless dextrine of modern manufacture, and "liquid glues" made from gelatine with a small addition of nitric, hydrochloric, or acetic acid, or of alum, aluminum sulphate, or zinc sulphate, have largely replaced the natural gums. To prevent fermentative change in this, as in so many other organic liquids, salicylic acid has been found to answer a useful purpose. It has been ingeniously proposed to apply the insolubility of chromated gelatine after exposure to light for sealing letter envelopes in such a way that they can only be opened by tearing or cutting the paper. The part of the envelope to be covered by the flap, and which is not touched by the lips or tongue, is coated with a preparation consisting essentially of acid ammonium chromate, copper and ammonium sulphate, and a little fine white paper fiber, while the inside of the flap is coated with isinglass gelatine dissolved with the aid of acetic acid. When the envelope has been closed, the two prepared surfaces are after a short time united so as to resist the action of cold or hot water, steam, and weak acid or alkaline solutions. The same material, chromated gelatine, has been employed as a varnish to render paper waterproof. In a different direction gelatine has been made available for writing purposes, by converting a mixture of its strong solution with glycerine into the simple and useful tablets which, under various names, such as "hektograph," "polygraph," etc., have been applied to the reproduction in numerous copies of letters and other ordinary writings in aniline ink.

Artists' pigments.—To the list of the fine pigments employed by artists there are frequently made additions, but the number of new and really valuable materials under this head is quite small. Probably the most important for some years have been artificial ultramarine of various tints, Guignet's bright chrome green (chromic oxide), and cadmium yellow (sulphide of cadmium). The aniline colors, in the form of lakes, have furnished a number of bright effects, but these blend but poorly to delicate mixed tints, and are sadly wanting in permanence on exposure to light. This latter defect constitutes a grave objection to the use of the vivid "iodine scarlet" (mercuric iodide). Uranium yellow (chiefly sodium uranate) has been a little used as an ordinary pigment, but serves mainly the purposes of glass staining and decorating porcelain. Of the other colors which have more or less come into use of late years may be noticed cobalt yellow (Fisher's salt—cobalt and potassium nitrite), light or lemon chrome yellow (barium chromate), Indian yellow (Purree—magnesium euxanthate—long known in the East, but of still very uncertain origin), Cassel green (barium manganate), Arnaudon's and Matthieu-Plessy's greens (chromium phosphates), tungsten greens (copper and chromium tungstates), tungsten blue (tungsten pentoxide), tungsten white (barium tungstate), and copper brown (cupric ferro-cyanide). None of these, however, can be considered as additions of first-class importance to the list of well established pigments.—*American Chemical Journal.*

* As evidence of the eagerness with which any new fiber really fit for paper-makers' use is seized upon, it may be mentioned that England imported of esparto, in 1860, less than 1,000 tons; in 1865, more than 50,000 tons; in 1871, 140,000 tons.

† Bamboo fiber has long been used in China, and, to a less extent, in Japan.

Recent Progress in Agricultural Science.

By H. P. Armsby.

Respiration.—That plants, like animals, take up oxygen from the air, to exhale it again in combination with carbon and hydrogen, is a fact which has long been known. The reverse process of the reduction of carbonic acid by the green parts of plants is, however, a much more striking and apparently characteristic function of vegetation, so that it has come to pass that the first-named process has been comparatively little studied, and the second has not infrequently been called the respiration of plants, thus tending to convey the notion of a fundamental difference between plants and animals as regards their relations to the oxygen of the atmosphere. More recently, however, greater accuracy of nomenclature has prevailed, the absorption of carbonic acid and exhalation of oxygen being designated as assimilation, while the term respiration is applied to the process which is identical in its general character in plants and animals, and which is essential to all life, viz., the taking up of oxygen and its use in the organism to oxidize complex substances and liberate the latent energy which they contain.

The clear recognition of the importance of the respiratory function in plants has led to numerous investigations which have disclosed some interesting results. According to the views described in a previous article, the respiration of plants is closely connected with their proteid metastasis and is a function of the protoplasm of the living cells. This

view appears *a priori* very probable, since all vital activities are manifested through protoplasm, and is supported by analogy with the respiratory process in animals, where, we believe, the decomposition of matter in the cells of the body is the primary process, while the oxygen which is taken up unites with the products of this decomposition. The observations of Corenwinder also favor this view. He found* that respiration, as measured by the amount of carbonic acid given off, was much more active in young parts of plants, rich in protoplasm, than in those older parts in which the proportion of protoplasm was much less. Freyberg† has made similar observations. He executed comparative respiration experiments on land and marsh plants, measuring the amount of oxygen taken up, and found that the former showed a much greater intensity of respiration, while analysis showed them to be also richer in nitrogenous compounds. On this fact, in connection with the greater supply of air to the interior of aquatic plants through their air-ducts, he bases the explanation of the fact that the roots of these plants thrive in a soil nearly or quite destitute of oxygen. Even among land plants the rate of respiration was found to follow pretty closely the percentage of nitrogen in the dry substance.

Internal Respiration.—As just stated, respiration proper is thought to consist in the oxidation of the products resulting from the splitting up of the nitrogenous matters of the protoplasm. This splitting up itself is believed to take place independently of oxygen, and frequently it goes on in the absence of this element. One of the products of this action is usually, if not always, carbonic acid, which under proper conditions is exhaled, and this process is generally called internal respiration. The action of yeast, and especially its so-called "self-fermentation," furnishes a good example of internal respiration. The force necessary to sustain the life of the plant is produced solely by the splitting up of the materials of the cell, and not partly by oxidation as is normally the case in the higher plants. Other fungi behave similarly. Müntz,‡ in observations on *Agaricus campestris*, confirmed in the main the results of previous investigators, and showed that this fungus in the presence of oxygen took up this gas and exhaled carbonic acid, while in the absence of oxygen the exhalation of carbonic acid still continued and alcohol was formed in the plant.

A similar process takes place also in the higher plants. Bohm§ has found that when green leaves are placed in a limited volume of an indifferent gas in the dark, the volume of the gas increases, carbonic acid being formed in the leaves by internal respiration and excreted. When the same apparatus was exposed to sufficiently strong light, no change in the volume of the gas took place, the carbonic acid being decomposed again as soon as formed, while the oxygen liberated was applied to sustain normal respiration. So too it was found that when green leaves were placed in a mixture of hydrogen and nitrogen containing 6 to 10 per cent. of carbonic acid and exposed to the sunlight, the volume of oxygen given off was greater than that of the carbonic acid assimilated, and that the difference was more marked the longer the apparatus remained in the dark after being put together. This excess of oxygen came from the reduction of the carbonic acid formed by internal respiration. Deherain and Maissan‖ have also observed that green leaves continue to excrete carbonic acid in an atmosphere free from oxygen.

In Bohm's experiments leaves of *Juglans regia* were chiefly employed, and these organs were found to be very sensitive to the presence of oxygen, the smallest trace of this gas in the surrounding atmosphere being sufficient to suspend the internal respiration. Further experiments showed that this was not always the case. When green twigs of woody plants were placed in air or oxygen over mercury in the dark, a diminution of the volume of the gas at first took place, which was attributed either to a chemical retention of oxygen by the organic matter of the twig or to a mechanical retention of the carbonic acid formed in respiration. Before, however, all the oxygen was consumed the volume of the gas began to increase, carbonic acid being formed by internal respiration and exhaled. With slender twigs this only took place when all but a trace of the free oxygen had disappeared, but with thicker twigs it began in an atmosphere which still contained several per cent. of oxygen. The cause of this phenomenon is evidently that the air as it diffuses into the twig is gradually robbed of its oxygen, so that the central cells receive none, and thus exhibit internal respiration while the surrounding air still contains a considerable quantity of oxygen.

The internal respiration of such green twigs may also be rendered evident by immersing them in boiled water and exposing them to sunlight, as was done by Bohm. Treated in this way in the dark, they turned brown in two or three days and entered into butyric fermentation, but in direct sunlight they mostly remained fresh for a week or more and evolved considerable gas (sometimes more than their own volume), consisting chiefly of oxygen. This oxygen was evidently derived from the carbonic acid produced by internal respiration.

This evolution of oxygen by green parts of plants under boiled water in sunlight is, as Bohm himself points out, not a new fact. It was observed by De Saussure in experiments on *Cactus opuntia*, but the cause of the phenomenon was quite different in this case. These plants have the power of absorbing their own bulk or even more of carbonic acid in the dark, and when afterward exposed to the light set free a corresponding amount of oxygen. De Saussure also observed frequently an evolution of carbonic acid by plants placed in oxygen-free media, but considered it a product of decay, holding that no life was possible in the absence of oxygen. It thus appears that Bohm's results of themselves are not new, but differ from the old ones of De Saussure only in the interpretation given them.

It should likewise be mentioned that Ad. Mayer has observed a similar evolution of oxygen by certain *Crassulaceæ*, which was due to the reduction of organic acids in the plant, and that he suggests the possibility of a similar interpretation of Bohm's experiments.

Normal Respiration.—Commonly, when we speak of the respiration of plants, we mean the respiration which is sustained by the oxygen of the external air, and this respiration we may designate as normal or external respiration to distinguish it from the internal respiration just spoken of.

Several recent investigations have had it for their object to ascertain the relations of normal respiration to the temperature and to growth. Among the earliest of these is

* Jahresber. Agr. Chem., N. F. 1, 312.
† Landw. Versuchs-Stationen, 23, 62.
‡ Jahresber. Agr. Chem., 18-19, 1, 400.
§ Liebig's Annalen, 185, 248.
‖ Jahresber. Agr. Chem. 16-17, 1, 273.

that of v. Wolkoff and Ad. Mayer.* They experimented on germinating seeds, chiefly of *Vicia faba* and *Tropæolum majus*, in an apparatus devised by them, which permitted a very exact measurement of the amount of oxygen taken up from a confined volume of air. Preliminary trials showed that under uniform conditions the respiration remained constant for several hours, and that the pressure of the air in the apparatus and the percentage of oxygen which it contained had, within quite wide limits, scarcely any effect on the rate of the respiration. It was also found that while changes of temperature affected the rate of the respiration, the latter promptly returned to its original amount when the original temperature was restored. Several series of experiments were then made to determine the influence of temperature on respiration. For temperatures ranging from 16° C to 35° C. the intensity of the respiration (*i. e.*, the quantity of oxygen taken up in a unit of time) was found to be directly proportional to the temperature reckoned from the freezing point of water. Above 35° the plants began to suffer from the high temperature, the tips of the stems appearing flaccid and translucent like frozen or boiled tissue. Exactly these parts, now, are the seat of rapid growth and consequently of rapid respiration, and as a natural consequence the intensity of the respiration was found to diminish at these high temperatures. The authors believe, however, that the respiration of the uninjured parts of the plants continued to increase with the temperature, though not so rapidly as below 35°. At any rate, these results indicate that the optimum temperature for the respiration of these plants is quite high, and considerably higher than the optimum temperature for the growth of most plants which have been examined in this respect.

Experiments were also made upon the influence of light on respiration. As is well known, the effect of light on growing plants is to decrease the growth in length. This effect might be explained very plausibly by the supposition that the light increases the oxidation of the substance of the plant and thus diminishes the supply of matter for the formation of new tissue, but these experiments showed very decidedly that sunlight had certainly only a very slight influence, and most probably none at all, upon the rate of respiration.

These two series of carefully conducted experiments are valuable for the facts they have brought to light regarding the relations of respiration to temperature and illumination, but they are even more valuable because they show that while growth and respiration are more or less related processes, they are not so intimately connected that the amount of one can be inferred from that of the other.

Schützenberger and Quinquand, and also Deherain and Maissan, have likewise observed that the respiration of plants proceeds at the same rate in darkness and in light.†

Ad. Mayer‡ has also investigated the respiration of germinating wheat by means of the apparatus devised by him in conjunction with v. Wolkoff. The results were controlled by determinations of the loss of dry matter suffered by the seedlings, it being assumed that the substances destroyed in respiration had the composition of starch. The results obtained in these two ways were fairly accordant. In the later stages of growth, when the plants became too large to be contained in the respiration apparatus, the second method alone was employed.

The wheat used was all from the same crop and of very nearly uniform weight, each grain weighing 0·05 gramme. After soaking for a suitable time, it was allowed to germinate in the dark, and the rate of respiration, *i. e.*, the amount of oxygen consumed per day, the daily growth in length, and the loss of dry matter were determined.

Three series of experiments were made, at temperatures of 11·8°, 23·8°, and 34° C. In each case the rate of respiration was found to increase rapidly at first, to reach a maximum after a certain time, and, after remaining nearly constant for a short time, to again decrease as the supply of organic matter from the seed became exhausted. A comparison of the results obtained at different temperatures showed, as was to be expected, that at high temperatures the maximum rate of respiration was higher and was reached more quickly than at low temperatures, while the decrease after the maximum was passed was equally rapid. The same amount of organic matter which was oxidized in 34 days at 11·8° C., was oxidized in about 16 days at 23·8° C., and in 10 days at 34 C°.

As regards the relations between respiration and growth (as expressed by the increase in the length of the plumule), it was found in the first two series that the rate of growth corresponded pretty closely with the rate of respiration, though the former reached its maximum a little later than the latter. In the third series only the loss of dry matter was determined, and this was found not to furnish sufficiently accurate data for a similar comparison. An interesting result was reached by comparing the total amount of organic matter oxidized in the three cases with the total amount of growth.

	Days from beginning of experiment.	Loss of dry matter by 4 seedlings.	Length of plumule.	Length of longest root.
I.	34	0·090 gram.	222 mm.	29 mm.
II.	16	0·089 "	252 "	111 "
III.	10	0·090 "	147 "	106 "

A direct comparison like this of plants from different series of experiments is somewhat uncertain, and the results are rather irregular. Nevertheless it is evident that the oxidation of the same amount of dry matter produced decidedly less growth of the plumule in the experiment carried on at a temperature decidedly above the optimum for growth. Mayer therefore concludes that at high temperatures part of the organic matter of the plant is oxidized without producing any visible effect on its growth. This result evidently points in the same direction as those already adduced, and shows that growth and respiration are not strictly parallel processes. In another investigation, supplementary to the preceding, Mayer§ has shown by means of respiration experiments executed on the same plants, that the intensity of the respiration is directly proportional to the temperature, beginning nearly at 0° C., and increasing regularly up to about 40° C. According to Sachs the temperature of most rapid growth for the wheat plant is about 29° C., so that we have here another proof of the partial independence of growth and respiration.

As noted, Mayer determined the amount of oxygen taken up by his plants. Rischawi has made experiments similar to Mayer's, but used an apparatus which enabled him to collect and weigh the carbonic acid given off by a large number of plants, and which made it also possible to continue the experiment with the same plants as long as was desirable. His results on wheat fully confirm Mayer's. Experiments on beans gave quite a different result. It was found that for nearly three weeks the rate of respiration remained practically constant, a result which is evidently connected with the large stock of reserve matters contained in these seeds, and which Rischawi explains by supposing that the cotyledons at first respire vigorously, and that as the young plant begins to respire more and more the respiration of the cotyledons becomes gradually less energetic.

* Landw. Jahrb., 3, 481.
† Jahresber Agr. Chem., 16,17, 1, 273.
‡ Landw. Versuchs-Stationen, 18, 245.
§ Landw. Versuchs-Stationen, 19, 340.

Rischawi also utilized this constancy of the respiration of the bean in experiments on respiration in pure oxygen. The receiver of his apparatus was filled with young bean plants and connected with gasometers from which either air or oxygen could be supplied at pleasure. The amount of carbonic acid excreted was determined every hour, the apparatus being filled with air for the first hour, oxygen for the second hour, and so on alternately. These amounts were found to be sensibly equal whether the respiration took place in air or oxygen. The experiments were executed at temperatures ranging from 3° C. to 30° C. with the same result.

In the first of these reports* mention was made of experiments by Bohm and by Bert, showing that growth cannot take place in pure oxygen at the ordinary pressure. Bohm found that the amount of oxygen taken up under these circumstances was the same as when the seeds were exposed to atmospheric air, while Bert found it to be less. Rischawi's results evidently confirm Bohm's, while they perhaps give another indication of the non-parallelism between growth and respiration.—*American Chemical Journal.*

ASBESTOS STOPPER FOR COMBUSTION TUBES.

SOME years ago, when working in the laboratory of organic chemistry of Harvard University, I conceived the idea of an asbestos stopper for combustion tubes, which I make as follows: The asbestos is separated into fine threads, moistened with water, twisted into a plug, crowded into the cylinder of an ordinary steel crusher, such as is used to pulverize minerals for analysis, and compressed by driving the piston of the crusher down upon it with a hammer, or better, by the screw of a vise. The plug is kept under pressure for several hours, then dried within the cylinder upon a sand-bath, pushed out of the cylinder, and after ignition over a blast-lamp is ready for use.

In this condition the plug loses no weight under prolonged ignition, is elastic enough to make a tight joint when fitted to a combustion tube of suitable size, and may be smoothly perforated with an ordinary cork borer.

Besides simplifying the method of organic analysis by permitting the substitution of short metallic tubes for the long glass combustion tubes in ordinary use, asbestos stoppers are very useful for closing bottles which contain substances corrosive to stoppers of rubber or cork.

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ACTION OF OZONE ON GERMS.

E. CHAPPIUS has attempted to show that ozone has the power to destroy the germs which are the cause of fermentation and other similar phenomena. For this purpose dust from the air was collected on cotton stoppers, and some of these exposed to the action of ozone. The ozonized stoppers were then brought in contact with liquid beer yeast, the necessary precautions being taken to prevent the introduction of other material. Even in twenty days no effect was produced in the clear liquid, while the unozonized stoppers caused turbidity even in a few days from the development of certain organisms. Hence ozone kills the germs in the air which can develop in beer yeast. Extended experiments may show whether there exist any relations between the sanitary condition of a place and the amount of ozone in the air, as according to modern views the spread of contagious diseases is caused by germs or low organisms which are transported by the air.—*Bull. Soc. Chim.*

ATOMIC WEIGHT OF PLATINUM.

K. SEUBERT has made a careful determination of the atomic weight of platinum, and finds it to be 194·46. According to the "periodic law" the atomic weight of platinum should be less than that of gold (Au=196 2), whereas hitherto it has been commonly accepted as greater. Platinum now takes that place in the series Ir < Pt < Au which would naturally be accorded to it if its properties be taken into consideration.—*Annalen der Chemie.*

ANALYSIS OF SOAPS.

MR C. HOPE, of St. Rollox Chemical Works, lately read a paper before the Philosophical Society of Glasgow, on "Analysis of Soaps." He said:

In this paper to the Section I intend giving, for the full analysis of soda soaps, a method which I have used for some considerable time, and which I find to be useful in giving information as to how the soap has been made, and also as giving an exact analysis of it, which is much desired by some consumers, and not usually done by analysts. In some cases a much shorter analysis will suffice, but in a soap works laboratory the full one will be very often wanted. Before weighing off portions of the soaps I think it is absolutely necessary to cut off the outer skin and take the inside, otherwise discrepancies will result not otherwise to be accounted for. The skin is a very small portion, usually of the bar or cake, and it would be a difficult operation to get the proper amount of skin in the different portions weighed.

Water.—The first thing to be done is to cut some thin shavings of the sample, weighing about 5 grms., and place them in a small, tared, flat porcelain basin, and the exact weight noted. It is then put in the water-bath, and heated until it ceases to lose weight; a night generally suffices for this purpose. When that is done it is weighed in the morning, and a number of small holes made with a pin in the dried slices, and put in the bath again for a few hours and reweighed. If there is no further loss, as is generally the case, it is certain the soap is thoroughly dry. Some chemists have condemned this method of estimating the water, because they say it fails to give off the last 1 or 2 per cent.; but I find that such is not the case, because when a soap is dried as I have described, it will give no further loss even if heated to its decomposing point.

Fatty Acids.—A portion of the soap, weighing about 5 grms. in the form of miniature bars, is introduced into a separating funnel of about 120 c.c. capacity, and about 50

* *American Chemical Journal*, 2, 342.

c.c. of water at, say, 100° F. poured in, then enough acetic acid to decompose the soap and leave a small excess, and finally about 50 c.c. of ordinary ether. The stopper is then put in the funnel, and the whole shaken until the soap is all dissolved. It is then allowed to settle for a few minutes, when the fatty acids will be found to have dissolved in the ether, and floating on the watery solution which contains the soda salts, etc. The bottom stopper is then opened slightly, and the watery solution of the salts allowed to *drop* slowly out until it stops, then the top stopper is taken out, and the remainder of the water allowed to drop slowly out until only a few drops remain, at which time the stopper is shut. The funnel is then filled up with water about 90° or 100° F., the stopper replaced and shaken for a minute or so, allowed to settle, and the same operation as before repeated. The washing is continued until the washings are neutral, at which point the last few drops are allowed to go out, taking care not to allow any of the ethereal solution to follow it. It is always necessary to open the bottom stopper first, as there is enough ether vapor in the funnel to cause an outward pressure, which on opening the top stopper first causes a few small drops of the ether solution to splutter out, a proceeding not to be desired, and which is effectually prevented by operating as described. The dropping of the washings is to be carefully done, otherwise the washings will be found to have a skin of fatty acids floating on the surface, which of course would cause a low result, and therefore must be carefully guarded against. The ethereal solution of the fatty acids is then poured out by the top of the funnel into a previously-tared beaker of about 150 c.c. capacity, and the funnel rinsed out with fresh ether. The beaker is then covered with filter paper and placed on the top of the water-bath until the ether is evaporated. If the odor still remains in the beaker a few minutes inside the bath remove it completely. If the water has not been completely removed from the funnel, a few small drops of water will be seen in the fatty acids and may be removed by the addition of a few drops of absolute alcohol, and then heated inside the water-bath until its odor is gone. The beaker is now cooled and weighed, and when the tare is deducted gives the weight of fatty acids in the quantity of soap taken.

Total Alkali.—For this determination I take 31 grms. of the soap, and put it into a 500 c.c. flask, and dissolve with the aid of heat in hot water; 50 c.c. of standard sulphuric acid are then added, and the flask filled up to the mark; 100 c.c. are filtered off, put into a beaker, and titrated with standard pure caustic soda, using litmus as an indicator. The acid used is a normal one, 1 c.c. = 0.062 grm. Na_2O, and the soda is one-tenth of that strength, 1 c.c. = 0·0062 grm. Na_2O.

Sodic Chloride.—To the above neutralized solution some solution of yellow chromate of potash is added, and then titrated with a decinormal solution of silver, 1 c.c. = 0·00585 grm. NaCl.

Free Alkali.—3·1 grms. of the sample in thin shavings are weighed off and dissolved in rectified alcohol, then filtered as rapidly as possible, and the insoluble matter washed with boiling alcohol. A few drops of alcoholic solution of phenol thalein are added to the filtrate, and then titrated with the decinormal acid. This gives the free alkali existing as hydrate, usually only a trace or none.

Soda existing as Silicate and Carbonate.—The part insoluble in alcohol is dissolved on the filter with hot water, carbonic acid passed into the filtrate to precipitate a trace of lime usually in it, then thoroughly well boiled, and filtered. The filtrate is then titrated with the decinormal acid, using litmus as indicator.

Soda existing as Carbonate.—5 grms. of the soap are dissolved in rectified alcohol, washed as before, and the insoluble dissolved in water. The solution containing the carbonate and silicate is put into a flask fitted with a set of two U-tubes containing solution of baric hydrate, and decomposed with dilute acid, and the CO_2 boiled out into the U-tubes. The baric carbonate is filtered off as quickly as possible, the excess of hydrate washed from it, and the precipitate titrated with standard decinormal acid.

Sulphate of Soda.—10 grms. of the soap are dissolved in water decomposed with HCl, and the fatty acids filtered off. The filtrate is precipitated with $BaCl_2$, and finished in the usual manner.

Silica.—25 or 50 grms. are ignited in a platinum basin, and the residue treated with HCl, evaporated to dryness, retreated with HCl, and the insoluble silica filtered off, ignited, and weighed.

Lime, Iron, etc.—The filtrate from the silica is made alkaline with ammonia, some oxalate of ammonia added, the precipitate collected, ignited, and weighed.

Calculation and Statement of Results.—The water, silica, lime, etc., and sodic chloride are simply calculated to per cent. The barium sulphate is calculated to per cent of sodic sulphate. The alkali soluble in alcohol is calculated to NaHO, and the acid used for titrating the baric carbonate to sodic carbonate. The "soda existing as carbonate" is deducted from the "soda existing as silicate and carbonate," and the difference stated as "soda existing as silicate." The silica cannot be stated as silicate of soda because the "silicate" as used and as it exists in the soaps is not a normal one. It has an approximate composition of $Na_2O_2.SiO_2$, but it is evidently not a definite compound, so that under those circumstances it is necessary to state the silica as such, and give the soda existing with it. It was pointed out by a writer in the *Chemical News* some years ago, and seems to be still ignored, that although in the process of analysis the fat is separated and weighed as fatty acid, it exists in the soap as fatty anhydride, as the following reaction representing the decomposition of sodic oleate by an acid shows:

$$2\left\{\begin{matrix}C_{18}H_{33}O \\ Na\end{matrix}\right\rangle O + 2HCl = 2NaCl + 2\left\{\begin{matrix}C_{18}H_{33}O \\ H\end{matrix}\right\rangle O,$$

and that by multiplying the fatty acids by the factor 97, the true weight of fatty matter existing in the soap was found. If the fatty acids are stated in the analysis it will be found that the analysis will total to nearly 102; therefore, because the per cent. of fatty acids are usually wanted, I generally report the analysis in the following manner:

		Per cent.
*	Fatty anhydride	
	Soda existing as soap	
	Water	
	Sodic carbonate	
	" hydrate	
	" chloride	
	" sulphate	
	Silica	
	Soda existing as silicate	
	Lime, etc.	
*	= Per cent fatty acids	
	Per cent total soda.	

There are two other important points in connection with soap analysis, viz., the determination of the resin and the melting-point of the fatty acids, that I intended to speak of in this paper, but I have not been able to get the experiments finished, so that I must leave them for a future communication to the Section. A method for the accurate determination of resin in soap, whether easy of execution or otherwise, is a thing still wanted. I have been working lately at a method which, although not a quick one, promised well for accuracy, and which I now find to give results short of the truth, because of the different resinic acids in rosin having different solubilities in certain reagents.

CHEMICAL EXAMINATION OF VOLATILE OILS.

By Prof. Wm. L. Dudley, Miami Medical College, Cincinnati, Ohio.

It is the object of this article to give, in a compact and convenient form, the properties and tests which are accepted by chemists and pharmacists as the most reliable for the various impurities contained in volatile oils.

It is true that many adulterants may be unnoticed, but it must be borne in mind that the adulteration of oils has become almost a science, and some have asserted that certain disreputable firms employ men whose duty it is to devise new methods of adulteration; the moment a new test for a certain impurity is published, they set to work to find something to use in its stead, therefore our desire is only to assist pharmacists in protecting themselves, as far as possible, against such frauds.

Oil of Anise.—The volatile oil of anise has a pale yellow color, which becomes darker by age, a sweet, aromatic taste and an agreeable odor. Its specific gravity generally varies from 0·970 to 0·985 at 16° C., but it sometimes rises in old oil to 1·028 (Zeller). At a temperature of about 10° C. (50° F.) the true anise oil solidifies, forming a crystalline mass, but the exact temperature varies considerably on account of purity and age. It is freely soluble in alcohol. Its rotating power is 1°. It has a neutral reaction to test paper. The commercial oil is sometimes adulterated with alcohol, wax, camphor, spermaceti, and the stearopten of fennel-oil.

Spermaceti and wax will remain insoluble when the sample is dissolved in 80 per cent. alcohol.

Camphor is said by some to be detected by the odor, when the solidified sample is pressed.

The stearopten of fennel-oil may be detected by the fennel odor developed when the sample is heated.

Oil of Bergamot—The volatile oil of bergamot of commerce has a green or greenish, and sometimes yellowish color, but after rectification it is colorless. It has an agreeable odor, which is less pleasant after rectification. The taste is aromatic and bitter. Its reaction is neutral, and its specific gravity varies from 0·8600 to 0·8825. It boils between 183° and 195° C. It deviates polarized light to the right from 7° (Pharmacographia), 23° (Watt), to 40° (Gladstone). It dissolves 25 per cent. of carbon bisulphide, and 8 per cent. of alcohol, sp. gr. 0·966. It is soluble in one-half its weight of alcohol sp. gr. 0·850, and in glacial acetic acid (Maisch and Stille). It is adulterated with turpentine and oil of orange.

Oils of orange and turpentine, when present, may be recognized by the sample requiring a larger amount of alcohol for its solution than if it was pure.

Volatile oils obtained by the distillation of the leaves and nearly exhausted rind with water, when present, render the oil of bergamot less fragrant.

Oil of Bitter-Almonds.—The volatile oil of almonds is a colorless or yellowish, limpid liquid, turning a ray of polarized light to the right; of a peculiar pleasant odor, and a burning, aromatic taste. Its specific gravity varies from 1·043 to 1·070, usually 1·060 (Hirsch). It boils at 180° C. (356° F.). It is soluble in about 30 parts of water, and in all proportions of alcohol, ether, chloroform, carbon bisulphide, and essential and fatty oils. It is often adulterated, and frequently contains hydrocyanic acid as an impurity.

Hydrocyanic acid may be detected as follows: Agitate the sample with water for a few minutes, and to the aqueous liquid add ferric chloride, ferrous sulphate, and finally a solution of sodium hydrate. Acidulate the liquid with hydrochloric acid, and if a bluish-green coloration or blue precipitate (Prussian blue) remains, it indicates the presence of hydrocyanic acid. In estimating the quantity present, the solution should be titrated with a standard solution of silver nitrate.

Benzoin occurs most largely in samples of high specific gravity. It gives a purple color with strong sulphuric acid, while the pure oil gives a crimson coloration, which becomes brownish on exposure to the air.

Alcohol may be detected by agitating the sample with about three times its volume of concentrated nitric acid and gently warming the mixture by placing the test tube in warm water. If the oil be pure, no reaction will take place; but if it contains over three per cent. of alcohol, effervescence will occur, with the evolution of yellowish nitrous fumes. Blyth recommends the addition of fuming nitric acid, and if 0·080 per cent. of alcohol is present, there is immediately strong effervescence.

Nitro-benzol (essence of mirbane) is indicated when the oil has a specific gravity greater than 1·070, and is not completely soluble in an aqueous solution of potassium bisulphate, but sometimes either alcohol or chloroform is added with the nitro-benzol in order to lower the specific gravity. The following method may also be employed: to one part of the oil add ten parts of dilute sulphuric acid (sp. gr. 1·117) and ten parts of granulated zinc, agitate frequently for about two hours, pass through a moistened filter, add to the filtrate a crystal of potassium chlorate, and a drop of concentrated sulphuric acid. If a violet or red color is produced, it indicates the presence of nitro-benzol. Maisch proposes the following method: one gramme of the oil is dissolved in twelve parts its volume of alcohol, 0·750 gramme of fused potassium hydrate is added, and the whole heated until the liquid is diminished about one-third. The pure oil, on cooling, is of a light-brown color and dissolves completely in water; but if nitro-benzol is present, the residue is brown, crystalline, and insoluble in water. Dragendorff says: "Pure almond oil, when treated with sodium, gives white flocks; if nitro-benzol should be present, the sodium will be immediately covered with yellow or brown flakes, according to the amount of adulteration; if the percentage rises as high as 0·3 to 0·5 per cent., the whole liquid, after a short time, becomes thick and opaque."

Chloroform may be easily detected by heating a small quantity of the suspected oil in a test-tube placed in a water-bath kept at a temperature not exceeding 65° C. (149° F.), when the chloroform, if present, will distill over, and on mixing a little iodine water with the distillate, the iodine will be absorbed, and if alcohol is absent, will separate with a rose color.

Essential oils may be detected as follows: If a little of the oil be dropped into a warm aqueous solution of sodium bisulphate of from 1·240 to 1·260 sp. gr., shaken, and then diluted with hot water, it is completely dissolved if pure, while if it contains other essential oils, complete solution will not take place.

Oil of Cajeput.—The volatile oil of cajeput is a limpid liquid having a penetrating odor, a green color, and a warm, camphoraceous, afterwards cooling taste. It is neutral, and is freely soluble in alcohol. Its specific gravity varies between 0·914 and 0·930, and it boils at about 173° C. It does not congeal at —25° C. Ammonium hydrate turns it yellowish, and sulphuric acid colors it brown, reddish, and finally purplish-brown. It dissolves iodine quietly, or sometimes with the evolution of reddish fumes. An imitation is made by a mixture of several essential oils.

Turpentine may be recognized by the sample being more soluble in alcohol, and by the more violent reaction with iodine.

Essential oils and fictitious cajeput oil may be recognized in the same manner as turpentine, and also by the odor of the sample.

Oil of Cinnamon (Ceylon).—The volatile oil of cinnamon is a pale yellow or reddish liquid, becoming red-brown and thicker on exposure to the air. It has a sweet and at the same time hot, aromatic taste, and a strong cinnamon odor. It does not congeal at 0° C. (32° F). Its specific gravity varies between 1·035 and 1.055, and increases by age. When fresh it is neutral, but when old it has an acid reaction. It is readily soluble in alcohol. It dissolves iodine almost without action, and soon forms a thick mass. On boiling it with nitro-prusside of copper it becomes red, and then dark brown. Fuming nitric acid produces a carmine color without causing effervescence. Ferric chloride slightly darkens its alcoholic solution. The oil of cinnamon is often adulterated with the oil of cassia and sometimes with the oil of cloves.

Oil of cassia in the sample may be detected by the differences in their physical properties, viz.: The oil of cassia is more brownish in color; its taste is less sweet; its odor less delicate; its specific gravity greater (usually 1·060 to 1·065), and it sometimes turns the ray of polarized light slightly to the right, while the oil of cinnamon either has no action or a slight left rotation.

Oil of cloves may be detected by the odor, when the sample is heated. In order to verify the above, a sample of the oil may be placed in a beaker and a few drops of fuming nitric acid added; if the oil of cloves is present, strong effervescence will take place. Another test may be employed as follows: Dissolve the sample in alcohol, and add to the solution a few drops of ferric chloride; if the oil of cloves is present in considerable quantity a purplish-blue color will be produced.

Oil of Cloves.—The volatile oil of cloves has a pale yellow color, but becomes darker on keeping. It has a strong odor of cloves and a burning aromatic taste. Its specific gravity varies between 1·030 and 1·060, while that of the oil of clove-stalks is 1·009. The oil of cloves boils between 240° C. and 255° C. It is freely soluble in alcohol. Sulphuric acid added to the oil produces a blood-red color, which finally turns blue. Ferric chloride produces a purplish-blue color in an alcoholic solution of the oil. Fuming nitric acid acts violently on it. Iodine dissolves in it quietly. A strong potassium hydrate solution converts the oil into a crystalline mass of potassium eugenate. The oil has little (—4° Gladstone) or no action on polarized light. The oil of cloves is often adulterated with cheaper oils and sometimes with carbolic acid.

Essential Oils.—If the sample is adulterated with other oils it is generally sufficient to determine the boiling point and specific gravity. On treating the sample with potassium hydrate in sufficient quantity the odor of cloves will disappear, and the odor of the adulterant may be detected.

Carbolic acid may be detected, according to Jaquemin, by adding to the sample a trace of anilin, shaking with water, and adding a little chlorinated soda, when a blue color will be produced. Fluckiger proposes the following: Agitate 6 to 10 grammes of the sample with 50 to 100 times its weight of hot water, decant after cooling, concentrate the clear liquid to a few cubic centimeters at a gentle heat, then add a drop of ammonium hydrate, and a small quantity of the chloride of lime. If carbolic acid is present, the liquid will acquire a green color on shaking, which changes into blue.

Oil of Copaiba.—The volatile oil of copaiba is a colorless or pale yellowish limpid liquid, which becomes slowly thicker and yellower on exposure. It has a pungent, bitterish taste, and the odor of copaiba. Its reaction is neutral, and specific gravity varies from 0·880 to 0·910. Its boiling point is about 250° C. It mixes with iodine without violent reaction; it dissolves in about 40 parts of alcohol specific gravity 0·850; and it yields a limpid liquid and crystalline compound with hydrochloric acid gas. It has lævo-rotary power. It is sometimes adulterated with the oil of turpentine.

Turpentine.—The oil of turpentine may be detected by the odor and also by the more violent reaction when a small quantity of iodine is added to the sample.

Oil of Coriander.—The volatile oil of coriander is colorless or pale yellow, having a mild and pleasant aromatic taste and odor; a specific gravity of from 0·860 to 0·870 and it boils at about 150° C. Iodine and fuming nitric acid act energetically on it; the latter producing a greenish resin. It is readily soluble in alcohol. It has been adulterated with the oil of orange.

Oil of orange may be detected, according to Leonhardi, by its insolubility in an equal bulk of 85 per cent. alcohol.

Oil of Erigeron.—The volatile oil of erigeron is a limpid liquid of a pale yellow color, a peculiar aromatic odor, and not very pungent taste. The odor somewhat resembles that of hemlock. Its specific gravity is 0·845 and it boils at about 155° C. The oil becomes viscid and of a reddish-brown color by age. It is slowly acted upon by fuming nitric acid in the cold; it dissolves iodine quietly; and a concentrated solution of potassium hydrate gradually colors it reddish. It is not very freely soluble in 80 per cent. alcohol. This oil is sometimes adulterated with cheaper oils.

Fatty Oils.—It is very seldom that one test suffices to determine the purity of an oil, and when such an examination is going on it is always desirable to employ several methods if possible. Weeks (Proc. Am. Phar. Assoc., vol. 20, p. 242) suggests the following methods for the determination of the purity of the oil of erigeron: 1st. The pure oil, when dropped upon fine, white filtering paper, leaves only a faint

yellow stain at the expiration of three hours; whereas, the impure oil would, if present, leave a dark, greasy spot. 2d. A solution of potassium hydrate, when agitated with an equal volume of the pure oil, and allowed to stand for a few hours, separates into two layers, imparting to the oil a red color. When the oil is impure, a partial emulsion or saponaceous mixture is produced, which settles into three layers, the intermediate one containing the fixed oil combined with the alkali. 3d. Concentrated nitric acid (sp. gr. 1·420) mixed with an equal bulk of the pure oil upon a watch-glass, at first unites, forming a uniform brown-colored mixture, possessing a peculiar odor of fresh-cut hay, which, at the expiration of twelve hours, concretes upon the outer edge to a dark-brown resinous substance surrounding a clear limpid liquid in the center covered with a thin white film. When an impure oil is subjected to this test the mixture formed is of a black color, devoid of the peculiar hay odor; it concretes to a black substance surrounding the fluid portion which is covered with a brown film. 4th. Concentrated sulphuric acid (sp. gr. 1·843) immediately forms a black mixture when it is mixed with an equal volume of the pure oil. The impure oil solidifies completely at the expiration of twelve hours, while the pure oil only concretes at the edges in the same length of time.

Oil of Juniper (Berries).—The volatile oil of juniper is colorless or pale yellow; it is a limpid liquid of a mildly aromatic smell and taste. Specific gravity 0·862 to 0·874, but poorer commercial samples sometimes have a specific gravity of 0·860. The pure oil boils between 140° C. and 150° C. It turns polarized light to the left. It dissolves with turbidity in twelve parts of alcohol, of a specific gravity of 0·830, and it is miscible in all proportions of ether and carbon bisulphide. It shows a neutral reaction to test-paper. Iodine acts energetically upon the limpid oil, sometimes producing fulmination (Nat. Disp.). The perfectly colorless oil does not fulminate with iodine, but the commoner kinds explode powerfully (A. W. Blyth). Sulphuric acid colors it brown and red. Old oil of juniper contains formic acid, from which it may be freed by sodium carbonate and rectification. It is sometimes adulterated with turpentine, which is generally very difficult to detect.

Turpentine.—Saturate the sample with hydrochloric acid gas, and if turpentine is present a solid crystalline compound will separate. It may sometimes be detected by the peculiar odor of the sample, especially after exposure.

Oil of Lavender.—The pure oil of lavender is a colorless, yellowish or greenish yellow, very limpid, and nearly neutral liquid; but it acquires an acid reaction and viscid consistence by age. It turns polarized light to the left, commences to boil at about 185° C.; dissolves with its own weight of alcohol of 0·835 to 0·850 sp. gr. Its taste is bitterish and pungent. When exposed to a low temperature a stearoptene separates. It reacts briskly and with some detonation with iodine, and with mercuric chloride it acquires a brown color. It is sometimes adulterated with turpentine and also with the oil of spike lavender.

Turpentine may be detected by the decreased solubility of the sample in alcohol.

Oil of spike lavender has a more terebinthinate camphoraceous odor, and a deeper greenish-yellow color, but the solubility is the same as the oil of lavender.

Oil of Lemon.—The volatile oil of lemon has an agreeable odor, pale yellow color, and a mild, aromatic, bitterish taste. The commercial article is generally turbid, but becomes clear on standing. Its specific gravity is about 0·852; it commences to boil at about 160° C.; it produces brisk fulmination with iodine; rotates polarized light to the right. By hydrochloric acid gas it is converted into a solid and liquid compound, which when distilled over lime yield colorless oil again; the solid substance is known as citrene or citronyl, and the liquid as citrylene, having a lemon-like odor. By age the odor and taste of the oil become pungent and terebinthinate, but this can be prevented or retarded by the addition of 3 or 4 per cent. of alcohol, and decantation of the clear oil from the sediment. The oil yields with Froehder's reagent a deep orange brown color (Dragendorff). The oil of lemon dissolves in seven parts of alcohol, sp. gr. 0·830, forming a turbid liquid. It is sometimes adulterated with other volatile oils.

Volatile oils of other fruits are extremely difficult to detect when used as adulterants for the oil of lemon, the odor and taste being the best means to rely on.

Oil of Mustard.—The volatile oil of mustard is colorless or slightly yellow; its boiling point is 148° C., and specific gravity 1·009 to 1·010; it is somewhat soluble in water; dissolves readily in alcohol and ether. It has a very pungent and acrid odor and taste. It prevents the coagulation of serum albumen, and also prevents alcoholic fermentation. The commercial oil is much adulterated with alcohol, carbon bisulphide, petroleum spirit, oil of gilliflowers, and castor oil.

Petroleum spirit may be recognized by drops which remain on the surface when a small quantity of the sample is allowed to fall in water; if the oil is pure it should settle to the bottom on very slight agitation.

Alcohol may be detected by the drops becoming opalescent when agitated with water; 5 per cent. of alcohol may be detected in this manner. The pure oil should remain perfectly clear.

Vegetable oils may be detected by dissolving five drops of the sample in fifty drops of strong sulphuric acid. The pure oil will dissolve to a clear, deep yellow liquid, while, if foreign oils be present they will char and the mixture will become brown or black.

Carbon bisulphide may be detected by the production of minute drops which render the liquid turbid when the test is performed, as above, for vegetable oils.

Oil of Peppermint.—The volatile oil of peppermint is a colorless, yellowish, or greenish liquid, which, on exposure, becomes brownish and viscid. It has a peculiar pungent odor, and a hot, sometimes camphoraceous taste which becomes bitterish by age, followed by a sensation of cold. When fresh, it is neutral to test-paper, and turns polarized light to the left. Its specific gravity is generally near 0·900, but varies between 0·840 and 0·940. It commences to boil near 190° C., and at a low temperature sometimes deposits crystals of menthol. It dissolves to a clear solution in from one to three parts of 80 per cent. alcohol, while more alcohol usually causes an opalescence, and a subsequent deposition of a minute white precipitate. Chloral hydrate produces a rose or cherry-red color with this oil (John, 1879); this reaction Dragendorff proved to be due to some impurity in commercial chloral hydrate (1875). Strong nitric acid colors it purplish or brown; but when from 50 to 70 drops of the oil are mixed with 1 drop nitric acid, sp. gr. 1·200, the mixture is gradually changed from yellowish to brownish, and finally to a permanent violet, blue, or greenish-blue when viewed in transparent light, while in reflected light the mixture is of a red-copper color and opaque; this reaction, which is not prevented by the oil of turpentine, may be hastened by warming the mixture or by decreasing the quantity of oil (Flückiger). Iodine does not act violently, but dissolves and renders the oil thicker. Picric acid dissolves in the oil of peppermint, forming a yellow solution which gradually turns green, and finally in the presence of air and water, becomes reddish-yellow (Frebault, 1874). Ethereal or chloroformic solutions of bromine produce a rose-red or violet color, which gradually changes to a dirty pink or purple. The oil is sometimes adulterated with the oils of erigeron, castor, turpentine, pennyroyal, and also alcohol.

Oil of Erigeron gives the sample a "weedy" smell and produces a disposition to resinify.

Castor Oil renders the sample less soluble in 80 per cent alcohol.

Oil of Turpentine renders the sample less soluble in 80 per cent. alcohol, and also acts on iodine with violence.

Oil of Pennyroyal.—Prepare a test solution by mixing about 4 c.c. of chloral hydrate and 2 c.c. of chemically pure sulphuric acid; rub together in a glass mortar, and add alcohol, drop by drop, until a clear solution results. In a watch-glass place a few drops of the oil to be tested and add an equal amount of the test, rubbing briskly for a few minutes; if the sample is adulterated with pennyroyal the mixture will become dirty olive-green, which will grow darker on standing. Pure oil of peppermint will assume a rich cherry-red color under the same treatment.

Alcohol, if present in sufficient quantity, will increase the solubility of the sample in 80 per cent. alcohol.

Oil of Rose.—The volatile oil of rose is a transparent, pale yellow liquid, which, when slowly cooled below 10° C., solidifies to a transparent mass composed of scale-like crystals, and fuses again on raising the temperature. The congealing and fusing points vary considerably; Baur gives the former as lying between 11° and 16° C., and Hanburg gives the latter between 16·1° and 18·3° C., and that of the English oil was found as high as 32·8° C. The fusing point of the German oil has been observed as high as 37·5° C., (Zeller). The oil of rose has a sweetish, rather mild taste, and an odor closely resembling that of the flowers. When suitably diluted with alcohol the oil is very fragrant. It is frequently adulterated with the Turkish oil of geranium, which is also known in England as the oil of gingergrass. Other oils are also used as adulterants, and the best means of detecting their presence is by determining the odor, the temperature of congelation, and the manner of crystallization of the sample. The pure oil of rose, when exposed to a temperature of 12·5° C., should congeal in a few minutes; the crystals should be transparent, scaly, and float on the surface of the liquid.

Oil of geranium, according to Ginbourt (*Jour. Phar.*, xv. 345), may be detected by adding strong sulphuric acid to the sample. If the oil be pure the odor will not be impaired, but if the oil of geranium be present a strong disagreeable odor will be developed. A second method is to expose the oil to iodine vapor, which does not alter the color of the pure oil, but colors geranium oil a very deep brown. Another method is to expose the sample to nitrous acid, which colors the pure oil deep yellow and geranium oil apple-green.

Spermaceti has been found as an adulterant of the oil of rose, and may be detected by cooling the sample to 12·5° C., and when congelation begins the crystals will float on the surface if the oil be pure, but if spermaceti be present they will sink to the bottom in the form of a solid crust.

Oil of Thyme.—The pure oil of thyme is colorless when freshly distilled, but on keeping it becomes deep red; the crude oil has a deep reddish-brown color. Its specific gravity varies between 0·870 and 0·900. Its odor is strong and aromatic, and it has a pungent, warm, and afterward cooling, taste. It does not fulminate with iodine. The pure oil of thyme is sometimes adulterated with turpentine.

Oil of turpentine, if present, may be detected by the violent reaction which ensues when a few drops of the sample are brought in contact with a small quantity of iodine.

Oil of Wintergreen.—The natural oil of wintergreen is usually of a reddish color, but by rectification it may be obtained colorless. It has a sweetish, warm, aromatic taste, and an agreeable, aromatic odor. It is the heaviest of volatile oils, having a density of from 1·170 to 1·180. It begins to boil a little above 200° C. It is readily soluble in alcohol and slightly soluble in water. It turns polarized light slightly to the right. Ferric chloride turns its solutions dark purple. A solid crystalline mass is obtained by agitating the oil with a concentrated solution of potassium or sodium hydrate. The natural oil is composed of about 90 per cent. of methyl salicylate and 10 per cent. of a hydrocarbon named gaultherilene, isomeric with turpentine. The artificial oil of wintergreen (methyl salicylate) is a colorless liquid having properties almost identical with those of the natural oil, except that it boils at 222° C.

The oil of wintergreen has been adulterated with a mixture of alcohol and chloroform, and also the oil of sassafras.

Alcohol and Chloroform may be detected by the low boiling point, and the character of the first fractional distillate. Chloroform can generally be detected by the odor when the sample is warmed.

Oil of Sassafras, if present, may be detected by adding a few drops of strong nitric acid to a small quantity of the sample; if the oil be pure it will remain unchanged at first and finally deposit white crystals of methylnitrosalicylic acid; but if the sample be adulterated with the oil of sassafras the solution will turn dark-red, and deposit a brown-red resinous mass. A second method is as follows: distill from the sample the chloroform, which is generally added when the oil is adulterated with the oil of sassafras, to give it the proper specific gravity, and to the residue add about one-fourth its weight of potassium hydrate dissolved in four parts of hot water, when the odor of sassafras will be at once apparent.—*The Pharmacist.*

VIOLET ILLUMINATION OF THE RETINA.

The author, fixing his eyes immovably on a sky illuminated by a uniform white light, and moving two fingers of his right hand rapidly and alternately backward and forward before them, saw, after a minute, a remarkable change in the uniform aspect of the heavens. There appeared on a white ground a mosaic composed of rather deep violet-purple hexagons, separated from each other by white lines, and forming a very regular design. The oscillations of the fingers should be from 300 to 400 per minute. The author thinks that these hexagons are due to the cones in the fovea and in the yellow spot, and that the white lines are due to their intervals.—*A. Charpentier.*

OBSERVATIONS ON THE COLORING MATTER OF FLOWERS.*

Translated by Adolf G. Vogeler, Ph G.

The investigations of Charles Darwin, on the fertilization of phanerogamous plants, have thrown new light on the importance of the colors in flowers. Since the transportation by insects of pollen to the stigma of another flower of the same species is an important factor in the struggle of plants for existence, it becomes evident that those flowers which, by their hues, attract the greatest number of insects, will develop from generation to generation those colors which prove most advantageous to them, until finally such colors become more or less stable.

But then this fact, however important it may be, does not suffice to explain the formation and the transformations of the coloring matter of flowers. Undoubtedly some chemical actions play an important role in the production of vegetable pigments. Marquart, Macaire, Schubler, Frank, and Lachmeyer have attributed the formation of vegetable coloring matter to oxidation or deoxidation, according to the presence of an acid or an alkaline body. Weiss and Trocul have examined the changes of color of chlorophyl grains. Sachs, Askenasy, and others have investigated the effects of light on the coloration of flowers. Pringheim, on the strength of the results of spectral analysis, considers all coloring matter in flowers, leaves, etc., derived from chlorophyl.

It is not my intention either to enumerate all the important labors connected with this subject, or to discuss the great importance of Pringheim's hypothesis, but I shall endeavor to demonstrate that chemical influences are capable of effecting changes in certain floral pigments.

The petals of *Pæonia officinalis*, when macerated in alcohol, impart to the same a beautiful red substance, very stable in the alcoholic liquid as well as in a dry state, but which, on the evaporation of the solvent, assumes a purple-violet tinge. Ether extracts from the red alcoholic solution (concentrated? A. G. V.) a very pale red pigment. On pouring a few drops of the nearly colorless ethereal solution into a test tube there will remain, after the evaporation of the liquid, a beautiful, reddish-violet substance. This change in the nearly colorless chromogen was produced by the action of atmospheric oxygen.

On adding to the strongly-diluted red alcoholic solution a little potassium binoxalate, a bright red color will appear. Adding to this liquid so colored, a very little at a time, small quantities of potassium or sodium carbonate, the color will pass successively through reddish purple, violet, and blue to green. Under the influence of light the green changes to yellow. In order to obtain a blue color a little of the concentrated alcoholic solution is dropped into some water, to give the latter a rose hue, whereupon a few drops of a solution of potassium or sodium carbonate are to be added.

The green coloring matter obtained is not fluorescent like chlorophyl; but still it presents the phenomenon of dichroism. When a ray of direct sunlight strikes the green liquid, the same presents a fine red appearance. I have instituted similar experiments with more than one hundred flowers, and have invariably obtained the same results, so that I am convinced of the existence in the red flowers, the purple, the violet, and the blue, of a chromogen substance, which is turned red by acids, while under the influence of basic compounds it becomes purple, violet, blue, green, and yellow.

The yellow color of flowers is very stable, acids and alkalies hardly affecting the same. Similar results are obtained with the yellow coloring matter obtained with the alkalies in the manner cited above.

The alcoholic solution of the red coloring matter extracted from peony presents a feebly acid reaction. When this solution, largely attenuated and hardly perceptibly colored, is treated with ferroso-ferric sulphate (prepared by dissolving ferroso-ferric oxide in sulphuric acid? A. G. V.), one obtains a strongly marked reaction, which indicates the presence of a body belonging to the group of proximate principles designated by the general name of tannin. This fact is somewhat interesting. Schell (*Jahresbericht*, 1875, 872), in his remarkable researches on tannin, attributes to that body the red coloration of autumn leaves. As we have demonstrated the existence in the petals of the peony of a considerable quantity of a substance belonging to the group of tannins, it may be presumed that there exists some genetic connection between this body and the beautiful red coloring matter of the flower. I have also established the presence of this same principle in the petals of the red rose, Ribes sanguineum, etc. The sepals of the peony are green, with a red border. The cells of the border contain the identical coloring matter as the petals; under the influence of oxalic acid the entire sepals will become red. When we now see chlorophyl in so many leaves, and flowers, and fruits, pass gradually through the various shades of pink, red, purple, and violet; when we cast our eyes on the lovely tints derived from chlorophyl, as seen in the foliage plants, such as the Dracæna, the Aroideæ, the Musaceæ, etc., the thought must naturally present itself that all the colors of flowers are produced by modifications of chlorophyl. But my object was only to present the facts, not to occupy myself with a new theory, however interesting the same may be.

CHEMISTRY IN ITS APPLICATION TO BREWING.

Hydrochloric Acid.—Symbol HCl.—This acid, which is the only known compound of chlorine with hydrogen, is also called muriatic acid and spirits of salt. It is prepared on a manufacturing as well as on a small scale, by acting upon common salt (chloride of sodium) with oil of vitriol (sulphuric acid); as soon as heat is applied, the hydrochloric acid is evolved in the gaseous state, and can be collected by passing the gas into water, in which it is very soluble. The chemical change involved in the reaction is expressed in the following equation, $NaCl + H_2SO_4 = HCl + HNaSO_4$, or, in other words, sulphuric acid acting upon chloride of sodium yields hydrochloric acid, and hydrogen sodium sulphate. Hydrochloric acid is a gaseous body which liquefies under a pressure of about forty atmospheres; it is colorless, but forms dense white fumes as soon as it comes in contact with moist air; it is heavier than air, and has a specific gravity of 1269. Hydrochloric acid is very soluble in water, and its solution constitutes the hydrochloric acid of commerce; in this state it is often of a pale yellow color, due to the presence of certain impurities, but when absolutely pure the liquid acid is quite colorless. The strongest commercial hydrochloric acid has a specific gravity of 1·21, and contains about 42 per cent. of the actual acid. Liquid hydrochloric acid exerts a very powerful action on most substances, and forms with the oxides of the metals a series of salts called chlorides, of which choride of sodium NaCl (common salt) is a familiar example. The presence of hydrochloric acid

* Prof. J. B. Schnetzler in *Bulletin Société Vaudoise Sciences Naturelles.*

in solution, either in a free state or in combination with a base, can be easily detected by adding a few drops of a solution of nitrate of silver, which at once forms a white curdy precipitate, insoluble in the strongest acids, but readily soluble in ammonia. It this manner the presence of chlorides in well and river waters can easily be detected and, by taking suitable precautions, their quantity can be estimated.

Nitro-Hydrochloric Acid or Aqua Regia, is the name given to a mixture of hydrochloric and nitric acids, which is chiefly remarkable for the property it possesses of dissolving gold and platinum, metals which resist the solvent action of all other acids.

Compounds of Chlorine with Oxygen.—There are three oxides of chlorine known, viz., chlorine monoxide Cl_2O, which yields with water the corresponding acid, hypochlorous acid, $HClO$; chlorine trioxide Cl_2O_3, yielding chlorous acid $HClO_2$, and chlorine tetroxide Cl_2O_4, to which there is no corresponding acid yet discovered. There are in addition two other oxygen acids of chlorine, viz., chloric acid $HClO_3$, and perchloric acid $HClO_4$, whose corresponding oxides have not yet been isolated. These oxides of chlorine have no immediate interest to the brewer, but it is well to mention that the substance called chloride of lime, or bleaching powder, is a mixture of calcium hypochlorite and calcium chloride, and is manufactured on an enormous scale by passing chlorine gas over layers of slaked lime; this chloride of lime exerts its well-known bleaching and disinfecting action as soon as it is exposed to the air, the carbonic acid in which is sufficiently strong to liberate chlorine from the compound. Of the other salts formed by the oxygen acids of chlorine, it is sufficient to mention the chlorate of potassium $KClO_3$, which is used for generating oxygen gas.

Iodine.—Symbol I.—Combining Weight 127.

This element, which is closely allied to chlorine in its chemical characteristics, is found chiefly in seaweeds and sea-water in combination with sodium and potassium, and also in small quantities in many mineral waters. Iodine is a bluish black solid possessing almost metallic luster, but it volatilizes at a comparatively low temperature (about 350° F.), and then forms a most beautiful purple colored gas. Iodine possesses a peculiar odor very similar to that of chlorine; it is slightly soluble in water, readily so in alcohol, and also in a solution of iodide of potassium. Iodine combines with hydrogen to form hydriodic acid HI, which corresponds to hydrochloric acid, and the acid forms a series of salts with metallic elements called iodides, analogous to the corresponding chlorides. There are several compounds of iodine and oxygen which form acids and salts similar to the corresponding chlorine compounds. Iodine and its compounds, although of importance in some industrial processes, and especially so in medicine, have no special interest to the brewer except in one important respect. This element constitutes a most delicate test for starch, with which it forms an intense and beautiful blue color. For this purpose the iodine must be in a free state and in solution. The test solution is easily prepared by dissolving a few grains of solid iodine in a little alcohol or in a dilute solution of iodide of potassium. It is important that it is not made too strong, and its color should not exceed that of dark amber ale. If a few drops of this iodine solution be added to a liquid containing only the minutest trace of starch, a dark blue color is immediately formed, and if the quantity of starch be large, a quantity of the blue iodide of starch immediately separates. It is evident that this test must be a valuable one to the brewer, for by means of it he can detect the presence of starch in his worts. It has been estimated that as small a quantity as 0·0001 per cent. of starch can be detected in 200 c.c. There are, however, several precautions to be observed. The solution to be tested must not be hot, as heat causes the blue color to immediately disappear. The solution to be tested must also be dilute and neutral or very slightly acid, as an alkaline solution completely prevents the formation of the blue iodide of starch. The different sugars give no color whatever with iodine, but several of the intermediate compounds between starch and sugar give colors varying in intensity from dark blue to an almost reddish brown. Pure dextrine gives no color with iodine, but there are several transformation products of starch of a dextrinous nature which are colored by iodine. In some cases a distinct red is produced, and therefore it is quite possible that the practical brewer in testing a wort for starch by means of iodine, may in some cases be deceived unless he is very careful, as the red color combined with reddish brown of the iodine itself tends to disguise the blue color produced by traces of starch. The following suggestions for testing for starch with iodine were made by Mr. Pickering in a recent communication: When iodine is added in excess to a mixture of starch and dextrin, the colors produced are blue, violet, purple, claret, red-brown, or brown, according to the various proportions in which the two substances are present. When the iodine is added gradually to the mixed solutions the colors produced, both temporary and permanent, follow the same order as those above mentioned, the blue colors appearing first, and the red ones only on the addition of larger amounts of iodine. Conversely, when the colored solution is allowed to stand, the red tints disappear first, and the blue ones last. Obviously, therefore, the gradual addition of iodine affords an easy and delicate means of detecting starch in the presence of even a large amount of dextrin. Another way in which starch may be detected in similar cases is to add an ample sufficiency of iodine to produce a permanent color, and then to heat the liquid; the brown iodine-dextrin is decomposed at a comparatively low temperature, while the blue iodine-starch remains till the heat is raised considerably higher, and again, on cooling, the blue tint reappears long before the brown or red tint does; even when there is not sufficient starch to yield satisfactory results by this method, it may often be detected by the liquid being of a more bluish tint after the heating than it was before it. Iodine, however, is a most useful test for starch, and one that ought to be used by every brewer during his mashing operations.

Sulphur.—Symbol S.—Combining Weight 32.

Sulphur is an element which exists abundantly in nature in both the free and combined states. In the neighborhood of volcanoes it is found in large masses and comparatively pure, and it is also extensively diffused through the globe in combination with the metals, often forming large rock formations. Iron pyrites and various lead, silver, and zinc sulphides are examples of these minerals. Sulphur also occurs in combination with oxygen and other elements, and often in enormous quantities. The beds of heavy spar and gypsum found in some parts of England are examples of these compounds. The soluble sulphates are also met with in most well and river waters, and, as is well known, the peculiar character of the Burton waters is due to the presence of a large proportion of sulphate of lime. Sulphur is also found to some extent in both plants and animals, especially the latter. The presence of this element in the white of egg, which is almost pure albumen, is evidenced by its action on a bright metallic surface, due to the formation of a black sulphide. Sulphur is a solid at the ordinary temperature, but can easily be converted into a liquid and even into a gas by application of a moderate heat. From a molten mass it separates in crystals, having the form of octohedra with rhombic bases. Sulphur is insoluble in water, but slightly soluble in ether and some oils, and readily soluble in bisulphide of carbon. Sulphur possesses the peculiar property of existing in three distinct states, each possessing peculiar physical properties of its own. The first of these so-called allotropic modifications is that in which sulphur usually occurs, namely, the crystalline. If these crystals be melted and then allowed to cool again, the mass crystallizes in long transparent prismatic needles of lower specific gravity, and different in many respects from the original sulphur; but these crystals gradually revert back to their original form. If sulphur be still further heated and then poured into cold water, it assumes a soft plastic form closely resembling caoutchouc; but this third allotropic modification also soon reverts to its original state. These modifications of sulphur are curious, and this element in this respect resembles the allotropism displayed by carbon and other elements. Sulphur, as is well known, is inflammable, forming in combination with oxygen sulphurous acid.—*Brewers' Guardian.*

A SULPHURETED HYDROGEN APPARATUS.*

By PETER HART.

WHEN hydric sulphide is only occasionally required, and then in small quantities, an apparatus which so furnishes it is useful, especially when it can be used repeatedly without washing out or replenishing. The one I have contrived seems to me to fulfill these conditions. There have been many invented, but they mostly require either many joints or especially formed pieces of glass. This one can be made by any one possessing only very small skill in fitting up apparatus. It consists of two test-tubes, the larger of *one* inch internal diameter, the other of such smaller diameter as to slide easily without friction into the larger. This smaller tube is by means of the blowpipe perforated at the bottom with a quarter-inch hole and is also provided with a rubber stopper and a gas leading tube bent twice at right angles. The larger tube has a piece of rubber tube two inches in length, and of rather smaller diameter than itself, pushed over its mouth, one inch on the tube and one inch projecting. This completes the apparatus. To work it fill the larger tube from one-third to one-half full of a mixture of sulphuric acid and water—one part acid, three parts of water. Drop a lump of iron sulphide into the smaller tube, insert the stopper with leading pipe firmly into this, and thrust its lower perforated end through the rubber mouth of the larger tube, pushing it down until it reaches the acid, and allowing sufficient of this to enter the perforation to cover the sulphide iron. Gas immediately commences to be evolved and can be bubbled through the solution to be examined. When sufficient has been obtained, raise the upper tube until the lower end is out of the acid, the remains of which at once drain away from the sulphide, and all action ceases, or practically so. It is only necessary to hang up the apparatus until again needed, when, by heating the end of the lower tube containing the acid over a Bunsen burner, and pushing down the upper, it commences full action again. This can be repeated until the acid becomes saturated, or so much so as to require replenishing.

Of course it need not be limited to the dimensions I have named. A much larger upper tube might be employed, which, combined with a suitably sized lower bottle, would furnish gas enough for a quantitative analysis. By occasionally sinking the upper tube deeper into the acid the stream may be fairly regulated, sufficiently so at all events for ordinary work.

* Paper read before the Manchester Literary and Philosophical Society, March 8, 1881.

SPONTANEOUS IGNITION OF VEGETABLE SUBSTANCES BY NITRIC ACID.

THE *Berichte der deutschen chemischen Gesellschaft* of February 28 and March 28, 1881, contain respectively two interesting and important articles upon the spontaneous combustion of vegetable substances by nitric acid, the one by K. Krant, of Hanover, and the other by R. Haas, of Carlsruhe, in both of which is pointed out the great danger of conflagrations accompanying the transport of nitric acid.

The spontaneous ignition of vegetable substances by nitric acid has long been conjectured by some, but freely doubted by others. The spontaneous ignition of a railway-wagon on the Bavarian Railway in 1879, however, led the managers to place the matter in the hands of the Polytechnic laboratory of Carlsruhe, and R. Haas, the author of the second paper above mentioned, was charged with the investigation of the matter. Before giving the results of his researches in this direction he, however, alludes to the previous paper by K. Krant.

The results of both Krant's and Haas' experiments admit of being shown as a lecture experiment, if not in the lecture-room itself, at least in an open yard or under a spacious stink-chamber.

K. Krant fills a square wooden box, 25 centimeters long and 40 centimeters deep, to the height of 15 to 20 centimeters with either straw, hay, tow, cotton-wool, or shavings, upon which he places a glass flask or beaker containing 25 to 100 c.c. of nitric acid of a specific gravity of at least 1·5. He then fills up the remainder of the box with one of the materials above mentioned, breaks the glass vessel containing the nitric acid, and at once closes the box with a well-fitting lid. In about one or two minutes vapors become visible, and a few minutes later a dense white smoke appears, due to the decomposition of the nitric acid, which is soon followed by the smoke arising from the combustion of the packing material. Upon opening the box five or, at the latest, ten minutes after the commencement of the experiment, the contents are found in a carbonized and lively smouldering condition, and upon the admission of air burst into flame, which often consumes the box itself.

With nitric acid of a specific gravity of 1·45 this author has not been able to effect a combustion.

Haas operates in very nearly the same way as Krant, but places the box containing the material to be operated on inside a larger box, and packs it in this with hay and tow so as to prevent loss of heat by radiation, which he considers to most nearly represent the conditions in a railway wagon. By this means he finds that even a weaker nitric acid than that used by Krant is sufficient to cause spontaneous combustion, especially in warm weather and when a large quantity of nitric acid is called into play, conditions which must often occur in railway and other transit.

REPORT OF THE COMMITTEE FROM AMERICAN PUBLIC HEALTH ASSOCIATION ON A PLAN FOR THE PREVENTION OF THE SPREAD OF VENEREAL DISEASES.

By ALBERT GIHON, M.D., Medical Director United States Army, Chairman.

YOUR committee, to whom was assigned the duty of suggesting some practicable plan for the prevention of the spread of venereal diseases, with especial reference to the protection of the innocent and helpless members of the community, beg to report:

That they have endeavored to consider the question without bias or prejudice, uninfluenced on the one hand by the misrepresentations of certain pseudo-moralists, who have uncharitably denounced in advance their assumed intention to recommend the governmental license of prostitution, and on the other, by appeals from no less earnest, honest, and righteous persons, who, with equal insistence, have urged the propriety and necessity for just such action.

Certain individuals—few of them physicians—have disputed the statement that syphilis is either very common, or so dangerous that it is beyond speedy and permanent cure. In the absence of exact numerical statistics, your committee believe it will be sufficient to refer to the experience of these medical practitioners who have had opportunities of judging, confident that they will, without exception, declare with Parent Duchatelet that "of all contagious diseases to which the human species is liable, and which cause the greatest evils to society, there are none more serious, more dangerous, or so much to be dreaded as syphilis; its ravages far surpassing those of all the plagues which at different times have terrified society."

With Professor Gross and Dr. Marion Sims, that "a greater scourge than yellow fever and cholera and smallpox combined is quietly installed in our midst, sapping the foundations of society, poisoning the sources of life, rendering existence miserable, and deteriorating the whole human family."

With Sir Thomas Watson, that "it counts its victims not only in the ranks of the vicious and self-indulgent, but among virtuous women and innocent children by hundreds and thousands."

With Sir James Paget, that "it would be difficult to overstate the amount of damage that syphilis does to the population, children being born with diseases induced by it, which render them quite unfit for the work of life."

With other eminent medical men quoted by Dr. Sims, in his inaugural address as President of the American Medical Association at Philadelphia, in 1876, Sir William Jenner, Prescott Hewitt, and Mr. Simon, chief medical officer of the Privy Council, who have borne testimony of their experience of its ravages among pure women and innocent children.

Statements such as these do not need to be backed by numerical data of questionable value. These can often be distorted to prove any point desired, by selecting for comparison maximum and minimum years—special returns from certain localities—as illustrated by the array of figures by which the opponents of the British Contagious Diseases Act have sought to prove that the sanitary surveillance of public women has actually augmented the amount of venereal disease in countries where it is exacted.

At best, but a small proportion of the venereal diseases ever appears on vital returns. The true statistics of their frequency are the professional secrets of the physician whose aid is sought to relieve them or whose eye recognizes them beneath the mask of other ailments. The most carefully-prepared reports fail to exhibit the rheumatisms, the cachexiæ, the cutaneous affections, the defects of vision, the lesions of the spinal cord, the brain, the hair, which have had syphilis for their cause. Especially is this true of transmitted syphilis. Only a few days ago, a distinguished American ophthalmologist declared to one of our committee that the majority of his infant patients were characterized by the oldish features, and notched incisors, and badly-shaped head which mark the syphilitic child, and he boldly asserted that interstitial keratitis was always a consequence of constitutional contamination. The greater proportion of venereal cases stalk about the streets in affected health and never appear in any returns. How many others find expression in suicide, in insanity, in conjugal infidelity, and actions for divorce!

As far as figures can be evidence, the statistics carefully collated by Dr. Frederick R Sturgis, of New York, are worthy of consideration. A summary of the poor treated, in 1873, at the various hospitals and dispensaries of the city of New York, enabled him to estimate the total number of venereal and syphilitic poor patients, but this did not include those treated at their homes, often by themselves, at physicians' offices, by apothecaries, and by quacks. Notwithstanding these omissions, of 280,536 poor persons receiving aid at public institutions, 12,341 suffered from venereal diseases, 5,045 of these being syphilis; that is, 44 in every 1,000 were venereal cases, 18 per 1,000 syphilitic.

In Mr. Wagstaff's report of the amount and kind of venereal disease under treatment at certain charitable institutions in London, in the year 1868, it is stated that sixty-nine in every thousand patients were venereal, thirty-five of these being syphilitic; and he estimates that, among the 1,500,000 of poor population of the metropolis who received medical relief for disease at hospitals, dispensaries, and at the hands of parochial medical officers, about one in fourteen is affected with venereal disease of some kind, this not including midwifery cases nor the classes excluded in Dr. Sturgis' report.

During the same year, 9,796 venereal patients were treated at the hospitals in Paris, and M. Lecour, prefect of police, estimating these as one-fifth of the total number of venereal patients treated at their homes by physicians, and who seek relief at the hands of apothecaries and charlatans, gives a sum total of 48,980 cases, about one in forty of the entire population. "A formidable array and one probably much below the real amount."

The same estimate of the proportion of private to public cases of five to one, arrived at by Dr. Sturgis from wholly different data, would give for New York, out of a much smaller population, 61,705 venereal patients in that year, 1873—nearly one in every fifteen of its men, women, and children—a number only dwarfed by comparison with London, where 100,000 poor alone are annually affected with syphilis.

Military and naval reports, while not free from the same objections of defective registration and classification, are, however, very much more exact, especially in the matter of enthetic diseases, there being less reluctance to apply for treatment and less dread of exposure on the part of the patient in a community composed wholly of men and no alternative but to consult the medical officer, who is required to include them in his returns. Your committee is indebted to the surgeon-general of the navy, army, and marine hospital service for official returns of the amount of venereal disease treated by medical officers in the naval and military services and mercantile marine of the United States during the last five years.

The last year of the Marine Hospital reports includes patients treated at the dispensaries and surgeons' offices outside of hospitals. Neither these nor the naval and military returns include the large number of cases not registered and treated surreptitiously by apothecaries, nurse, and hospital stewards. Officers generally avoid the necessary exposure, and their cases, consequently, seldom appear on the returns. Enough has been shown to establish this fact, that at least one man in every thirteen in the naval service of the United States—last year, one in ten; one in every nine in the army; of the negro troops, one in six; one in every seven of the British army; and one in every four of the merchant sailors presenting themselves for treatment at marine hospitals and dispensaries, is affected with some form of venereal disease.

Your committee are able, by the courtesy of the Surgeon-General of the navy, Dr. Wales, to supplement these alarming figures by the significant fact that, of the boys who were applicants for enlistment as apprentices in the United States navy during the year 1879, twenty per thousand—one in every fifty—lads under seventeen years of age—were rejected on account of venereal diseases, twelve of these being syphilitics. Furthermore, of the young men examined at a certain institution, which they had left two years before in good health, not one in five escaped venereal disease of some sort. There is no reason to believe that the proportion among other young men is less appalling. The family physician and the specialist for private diseases, advertised without disguise in the family newspaper, will never tell the tale of the tens of thousands who seek relief at their hands.

HOW SYPHILIS IS COMMUNICATED.

But, even were it possible to obtain accurate information of the number of cases of venereal disease contracted in cities, it would give no indication of the actual injury to the human race by these diseases. It would take no account of the myriads of the happily still-born, and the feeble offspring who bring their taint into the world with them, after having diseased their mothers during their intra-uterine existence; nor of those other myriads contaminated by mere contact with the infected who mingle in every crowd. Every one instinctively shrinks from the touch of the sufferer with smallpox, but how few realize that the syphilitic is a leper also to be shunned? How few mothers are aware of the danger to themselves and their children from nurses and housemaids drawn from a population in which every fifteenth person is diseased? How few parents suspect the peril to their daughters from her accepted lover's kiss, who may be that one in every five young men among the better classes who has a venereal disease, which there is one chance in two is syphilis?

These are not speculations. Gross has seen many cases communicated by kissing, and he tells of fifteen women, nine children, and ten men diseased by a midwife who had a chancre on her finger, contracted in the exercise of her profession, and who had thus carried the disease from house to house.

Marion Sims says: "I have seen a cook and chambermaid with syphilitic ulcers on the fingers, and nurses infected by the children who had been born of syphilitic parents, in turn infecting sucking babes born of healthy parents, and I have known a drunken vagabond husband to contract syphilis in a low brothel and communicate it to his wife, who unwittingly gave it to her four children simply by using the same towel and wash-bowl;" and one of your committee can add the case of an estimable and venerable lady who lost her eyesight this very year from using a towel in her son's room, carelessly left by him upon the rack, and another of the wife of a clergyman, who this summer sought relief at a Virginia spring for a horrible affection contracted in domestic contact with her servant.

The present Surgeon General of the navy, Dr. Wales, saw a number of cases of chancre of the lips among the smokers of one set of cheroots, of which the wrappers had been moistened by the saliva of a Manila cigar-girl, and at Beyrout he learned that it was not unusual for syphilis to be contracted by using a narghileh that had been pressed by the lips of a diseased smoker. Who would venture to eat the fig from Smyrna if he had seen the top layer of the choicest box pressed flat by the saliva-wetted thumb of a packer, who there was one chance in ten was syphilitic?

A member of your committee astounded an otherwise well-informed gentleman by explaining the risk he ran after he had been capsized in a river, in accepting the proffer of a flannel undershirt from a young man whose body was accidentally discovered to be spotted with a suspicious eruption.

A lady was equally alarmed when told by her husband, a physician, that she had invited to her table a young man, who, in the course of a physical examination that morning, had been found to have his mouth and tongue covered with mucous patches, and that her daughter was dancing in a public ball-room with another whose body was repulsive from syphilitic eczema.

A third invalid at a fashionable hotel had just settled himself in bed, when the odor of tobacco on the pillow prompted an inspection, which revealed sheets which had not been changed, and which, being a medical man, he quickly deserted, conscious that they might have shrouded a syphilitic predecessor.

An editorial in the *College and Clinical Record* of Philadelphia, of October 15, states: "It happened to the writer to be recently called to see a man of most respectable surroundings, who bore an unmistakable venereal sore upon his hip, and subsequently manifested all the features of secondary syphilis. It was said that this had followed a trifling surgical operation of the part affected for the removal of a slight deformity; the instrument or the hands of the surgeon communicating the specific virus in the same manner. It will be remembered, that a New York dentist not long ago communicated syphilis by his forceps, and a well-known laryngologist inoculated a number of patients with pharyngeal chancre."

When the public knows by how many thousand channels this disease may assail them, your committee have no doubt that they will demand protection at any cost, and they urge upon this association the promulgation of the fact that so long as syphilitics are allowed to go unrestrained the spotless woman and the innocent child share the danger of contamination with the libertine and prostitute.

Let it be known that this fearful pest may be communicated—

By the blankets of the sleeping-car, the sheets, towels, and napkins of the steamship, hotel, or restaurant;

By the hired bathing dresses of the seaside resort and the costumes rented for the fancy ball;

By the chipped edges of a coffee-cup, as seen at most hotels and eating-houses, and their half-cleansed knives, forks, and spoons;

By the public drinking vessel in the railway car or station, as well as the public urinal or closet;

By the barber's utensils, the brush and comb in the guest-chamber, the hatter's measure or the borrowed or sample hat;

By the surgeon's or dentist's instruments, or the vaccinator's lancet;

By the broom or dust-brush handled by a parlor-maid, or by the spoon touched by the mouth of the cook or nurse;

By the toys sold to children in the streets by venders with poisoned lips or fingers;

By playing-cards and visiting-cards, which have been used, and especially by car-tickets and by the paper money which circulates in a city where 50,000 syphilitics are at large;

By the loaned pipe, or cane, or glove;

By the grasp of a friend's hand or the kiss of an accepted lover; by the son to his mother and sister; the husband to his wife and unborn child, and by the latter to its mother.

Were venereal disease restricted to those who seek illicit sexual gratification it might be well to let the guilty suffer and die; but when their sin is sure to leave upon them an ineradicable taint and to be transmitted to their helpless offspring; when, worse than all, the syphilitic leaves his stain upon whatever he touches to foul the chance passer—man, woman, or child—as fearfully as if they had visited the vilest lupanar, it becomes the duty—the most important of all its duties—of this association to devise some plan for their protection.

Your committee have been charged with the suggestion of such a practical plan. Of the numerous propositions submitted to them, that most zealously advocated provides for the registration and compulsory examination of prostitutes, and the seclusion of those diseased; but this alone your committee does not hesitate to admit to be inadequate.

It has, undeniably, accomplished a wonderful amount of good in continental cities, in the military towns of England, in insular garrisons like Malta, and recently and remarkably in Japan. On this point the universal testimony of naval and military officers cannot be impeached. Fournier, one of the ablest of living syphilographers, declared to Medical Director Cines that syphilis had been virtually stamped out of Paris, when the advent of the German army reintroduced it; but he expressed his confidence that it would again be stamped out as before.

Colonel Fletcher, of the Surgeon General's office of the United States army, writes to your committee:

"In 1863, while I was on duty in Nashville, the question of periodical examinations of the prostitutes as a protection to the troops stationed at or passing through the city was referred to another medical officer and myself. We drew up regulations for the purpose, and for nearly three years the women were examined—at first every two weeks, but subsequently every ten days.

I believe this was the first occasion of any systematic inspection of prostitutes attempted in the United States. Its results may be briefly stated thus:

(1) The amount of venereal disease was markedly lessened, so much so that its occurrence came to be looked upon (absurdly, of course) as an imputation on the care of the examining surgeon. I have more than once known a company officer complain that a man was off duty for disease caught of such a girl, at such a time, and demand that she be sent to the hospital.

(2) The women who were at first rebellious, became quite reconciled to the system. I have known them come to the hospital voluntarily, desiring to be examined for suspected disease.

(3) It was self-supporting, the fees paying the expenses of the hospital.

To day the Nashville prostitute advertises herself in big gilt letters over her front door, before a blazing light, more conspicuously by far than were she enrolled in a police register, while purblind virtue and false morality stalk by and leave no other guarantee to society than the poor creature's own good sense that her house shall not become a focus of disease as disastrous as smallpox or diphtheria.

In ten years, the Surgeon General of the Navy is authority for stating, the amount of venereal disease on the Asiatic station has fallen from 425·8 to 112·1 per thousand, a difference of 313·7 per thousand, due to the examination of prostitutes practiced at Hong Kong and in Japan, and the seclusion of infected women in lock hospitals. The scandalous scenes which disgrace the chief thoroughfares of Liverpool and London and New York are no longer possible in cities like Paris and Lisbon and Hamburg, where public women are under police surveillance; nor is it true that clandestine prostitution attains such enormous proportions in places where the Gaukeiro or Yoshiwara confines the whore as in Japan, or where the temples of Venus Meretrix, as in Marseilles, have their own secluded quarter, to be shunned by the virtuous, that it does in Philadelphia and Boston and Brooklyn, where the respectable woman is jostled in every street by unsuspected courtesans, and unfledged boys are lured to disease by young girls in the garb of decent poverty.

"Doubtless," says Diday, "a sensible progress has marked the beginning of this century. With the establishment of a better regulated surveillance, we have seen the coincidence of the diminution of the number of venereal affections, but the persistence of the scourge is an evidence of the insufficiency of these measures." "How is it then," asks Fournier, "that syphilis is especially derived from inspected women? It is, on the one hand, because the relations with this class of women are more numerous; and, on the other, because the surveillance, which is exercised over them, is completely insufficient."

If the contagious diseases act of England has not accomplished all the good contemplated, it is because the act has not been stringent enough. If syphilis re-entered Paris after having been once stamped out, it was because every avenue for its approach was not carefully guarded.

The idle charge, endeavored to be substantiated by figures, that the inspection of public women has only induced a greater amount of disease, is not worth refuting; but the insufficiency of these inspections is evident—

Because, while discovering women who are diseased at the weekly or semi-weekly visit, it leaves them unprotected against the intermediate approaches of infected men and the unconscious contamination of their subsequent visitors;

Because minute abrasions, hidden deep in the vagina or among its rugæ, may escape detection;

Because a woman may undoubtedly be the vehicle of communicating disease from one man to others, without herself becoming infected;

Because women, who are not avowed and registered prostitutes, shop-girls, domestic servants, saloon attendants, ballet girls, choristers, kept women and the like are exempt from examination; and chiefly,

Because it ignores the men, who are the original contaminators of the prostitute.

Furthermore, in this country at least, it is a fact that prostitutes, except those of the lowest class, have learned that it is to their own interest to keep well. There are few public houses which do not now have their regular medical attendants, who examine the inmates and treat them when diseased, and the first lesson taught the young harlot is to carefully inspect her male visitor, however gentlemanly his exterior. As the erring country girl brings forth the fruit of her illicit amour as promptly as if wedded, because ignorant of her sinning city sister's devices to avoid such a calamity, so the poor shop-girl, unaware of the sanitary value of syringes and astringent lotions, is diseased by the well dressed admirer who has turned her head, when the professional whore would have driven him from her room. The young libertine of this day can, consequently, visit brothels with little risk. The sentimental objection that their location is thereby published and their nefarious trade advertised is of little weight beside the fact that the young man bent upon sinning might be saved from irretrievable ruin, who with no less moral turpitude, consorts with the shop-girl whose favors are bought with cheap jewelry, or the housemaid whose chamber is conveniently near his own, and who gratifies him without charge.

While believing that the police registration of brothels and their restriction to designated quarters under sanitary surveillance are in the interest of humanity and morality, and that this no more implies the recognition and countenance of the sin of immorality than the license of rum-shops and the taxation of whisky stills presupposes the encouragement of intoxication.

Believing that the toleration and connivance, through pretended ignorance of their existence, of bawdy-houses, bed-houses, cheap lodging-houses, spurious dressmakers' rooms and cigar shops, dentists' offices, and other notorious places of resort, and the freedom of exposure permitted in public places to the most adandoned and unmistakable whores, are the most monstrous blots upon the civilization of this century, and infinitely more reprehensible than their repression and sanitary and disciplinary control by the authorities.

Your committee, nevertheless, consider this to be rather a question of public morals than of public health, and they therefore, now only recommend as in their opinion the most effectual practical means of preventing venereal diseases, the enactment by the Legislatures of the several States of a law constituting it a criminal offense or misdemeanor to communicate, or to aid or abet in any way the communication, of a contagious disease such as small-pox or syphilis, and empowering and requiring health officials to establish such regulations as may be necessary for the prevention, discovery, treatment, and suppression of such diseases.

Deterred by the fear of public accusation and its consequences no diseased man would thereafter venture to cohabit with any woman, whether public harlot, clandestine strumpet, or his own wife.

Satisfied that the law would punish the unscrupulous wretches who have hitherto so cruelly wronged them with impunity, no woman would care to evade its application to herself, and not only the poor panderer to man's lust would have a greater incentive to preserve her personal cleanliness, but the proprietress of the bawdy-house would be equally responsible for and equally interested in the physical welfare of its inmates.

Inspections would be voluntarily solicited or cheerfully submitted to, and only those perversely negligent of sanitary observances and the degraded habitues of the lowest slums would become subjects of sanitary constraint, and with the professional burglar and black-leg, be treated as forever an object of suspicion.

It might open the way to false accusations by abandoned women, but they who object to any semblance of protection of vice can hardly find fault with this additional impediment to sensual indulgence.

Under the operation of such a law it would become the duty of every physician to exact from his syphilitic patient that voluntary isolation or seclusion which may be necessary to prevent contamination, under penalty of punishment of the former for his neglect to advise, or of the latter for his refusal to conform to the advice. While it is manifestly impracticable to require a physician to confine his syphilitic patient in a pesthouse, it is, nevertheless, his legitimate office to instruct him to shun such contact with his fellow-beings as may expose them to the risk of contamination. Military and naval medical officers already have, and the surgeons of the marine hospital service and those of emigrant and passenger ships ought to have, the right to ascertain the condition and the power to restrain the liberty of diseased men and others under their charge.

For the syphilitic who marries and contaminates an innocent woman and begets a diseased child the law can scarcely frame an adequate punishment, while no code of ethics should permit a medical practitioner to screen his infamy.

The plan proposed by your committee implies the appointment of sanitary officers in every hamlet, village, town, and city of the country, subordinated to and controlled by county, municipal, or State boards of health, and empowered to investigate and discover every preventable cause or form of disease, syphilis included. They further recommend the establishment of special or lock hospitals for the gratuitous treatment of all venereal affections, and in the absence of such hospitals provision for their treatment without charge and without unnecessary exposure of their victims by health officials under whose cognizance they have come, since, as Dr. Beardsley has well stated, "the cost of treatment for venereal lesions has become so heavy, the prices so exorbitant, that thousands are deterred from consulting a physician through fear of being fleeced." Professor Andrews quotes the case of a private disease doctor, one of a dozen in Chicago, whose receipts in a single month amounted to two thousand dollars. The special hospitals suggested would naturally supplement and not wholly supplant the private charities, dispensaries, and special wards in general hospitals

for the treatment of such as might be reluctant to enter the former, which, however, it is believed, might by thoroughness and care in treatment not only attract a large proportion of unfortunate sufferers, but ultimately become the means of accomplishing the reformation of many whose misdoings had led them thither to seek relief.

The plan proposed by the committee of the American Medical Association at Louisville, Kentucky, in 1877, consisting of Doctors Gross, of Philadelphia, Marion Sims, of New York, N. S. Davis, of Chicago, John Morris, of Baltimore, and J. M. Tower, of Washington, though in the same direction, is less comprehensive than that of your committee. They reported: "That in their judgment there is no possibility of stamping out syphilis until all the nations of the world are protected by proper legislative measures. Great difficulties, unfortunately, surround the execution of laws having for their end the prevention of syphilis, and it is impracticable, at the present time, in view of the ignorance and prejudices given to secure more than partial legislation looking to this purpose." We can, therefore, only hope to obtain the passage, at first, of enactments having in view the regulation of persons engaged in the military and naval service of the government, and also those ordinarily subject to the control and supervision of the police and municipal authorities of cities and large towns, though in the end we are convinced that the extension of this control and supervision to the whole civil population will be the inevitable legislation of all countries. Your committee have contemplated this wider application of the law in the plan they have concluded to submit, and which it only remains for them to formulate in the following resolution:

Resolved, That the American Public Health Association earnestly recommends the municipal and State boards of health to urge upon the legislative bodies of this country the enactment of a law constituting it a criminal offense to knowingly communicate, directly or indirectly, or to be instrumental in communicating a contagious disease, such as small-pox, scarlet fever, or the venereal diseases, and giving to the said boards of health, and to the State and municipal health officials under their control, the same power in the prevention, detection, suppression, and gratuitous treatment of venereal affections, which they now possess in the cases of small-pox or other contagious diseases.

After striking out the words, "Municipal and State Board of Health," the above resolution was adopted.—*New Orleans Democrat.*

THE PROPAGATION OF SYPHILIS BY RAZORS.

M. DESPRÈS has lately published two cases in which syphilis appeared to have been communicated through the medium of the razor during the process of shaving (*Journal des Connaissances Médicales*, quoted by the *Brit. Med. Jour.*) In the first case, a man, aged fifty four, of steady habits, and with no history of venereal disease, was shaved by a barber on July 11, 1880. The man observed, after being shaved, that he had three small cuts on the chin. On July 25, the patient (who had had no relation with women for ten weeks) noticed a swelling at the side of each of the cuts first noticed after the shaving. On September 1, the patient came under the care of M. Desprès, having been sent to the surgeon as a case of epithelioma. On examination, there were found three ulcers on the chin, surrounded by some red and moderately hard callosities. There was a hard gland beneath the jaw, but none elsewhere. No other signs of syphilis were discovered at that time. On September 15, a papular syphilide appeared. The second case, that of a young man, aged twenty-two, was in many respects similar to the preceding; in him, also, the initial lesion appeared on the chin, but the patient did not remember having been cut by the razor. In due time, glandular enlargement and a general syphilide followed.

SMALL-POX.—THE RESULT OF ATTEMPTING TO CHECK ITS SPREAD IN CHICAGO.*

By OSCAR C. DE WOLF, M.D., Commissioner of Health.

As a basis for the discussion of the subject, and a statement of the views I entertain and methods employed in this city for preventing the spread of small-pox, I offer the following propositions, which may form a conclusion to this note:

I. All physicians and householders should be required by law to report, on first knowledge, to the proper authorities, all cases or suspected cases of small-pox.

II. When, from local condition or general prevalence of the disease in locations accessible to our population, there is reason to fear a troublesome invasion of the disease, every case discovered before the suppurative stage should be removed to the hospital, and every house in which a patient is found at a period too late for removal—*i. e.*, after the suppurative period has commenced, should be continuously guarded by a police officer until the patient is dead or removed from surveillance.

III. The following precautions should be taken in regard to disinfection:

(*a*) The body, immediately after death, should be wrapped in a sheet saturated with 50 per cent. solution of carbolic acid, closely coffined and buried under police direction.

(*b*) The house, furniture, and clothing from which the dead or living have been removed should be fumigated with sulphurous acid gas or chlorine gas, and remain under police observation for eight hours.

(*c*) The convalescent, before leaving hospital or domicile, should receive several warm disinfecting baths, paying special attention to the hair; and, if from the hospital, all clothing should be perfectly fresh or fumigated.

IV. When general infection is feared, general vaccination should be compulsory and vigorously executed, if necessary, by police power.

I am of the opinion that Chicago has escaped an epidemic of small-pox twice during the past four years by a faithful execution, to the utmost detail, of the above programme, although in one instance (1878) I received more censure from a portion of the press and from some citizens than from any sanitary service I ever performed, one daily paper counseling the citizens to "shoot down the health officers like dogs if private domiciles were invaded."

The result, however, justified the means, and compliments all around terminated the labor. There have been but three instances during the past four years, so far as I am informed, of failure to report cases of small-pox. On each occasion the attending physician was brought before the courts and fined $50.

On receipt of notice of small-pox, a medical officer is immediately dispatched to investigate the case, and if in his judgment removal is proper, he telephones the fact to the central office, and the ambulance is hastened to the location. The isolation of the afflicted by removal to the hospital was in some cases strenuously opposed by the patient or family, who insisted that under our form of constitutional government such removal, when compulsory, was a violation of the law and inconsistent with the preservation of personal liberty.

In 1877 the following ordinance was passed by Corporation Counsel (now Judge) Anthony, and immediately adopted by the City Council:

The following is the ordinance as passed:

"ORDINANCE.

"*Be it ordained by the City Council of the City of Chicago:*

"SECTION 1. Section 4, chapter 17 of the Revised Ordinance of the City of Chicago, compilation of 1873, is hereby amended by the addition of the following proviso:

"*Provided*, that in case such health officer be resisted or opposed in making such removal of any person so affected with an infectious or pestilential disease, the person or persons so opposing or resisting such health officer shall be fined therefor not less than $25 nor more than $200; and such health officer, whenever it shall become necessary, in order to make the removal of any person so affected with any infectious or pestilential disease, as provided for in the section to which this is an amendment, is hereby authorized, empowered, and commanded to break open the door or doors of any house in which such sick person is, and to use such force as may be necessary to effect such removal. And the police department of the city shall, when requested, furnish the health officer with all necessary assistance.

"SEC. 2. This ordinance shall be in force from and after its passage and due publication."

In my opinion, the power delegated to the municipal authorities by this ordinance is beneficent and salutary. The propriety in all cases and the absolute necessity in many of the isolation secured by hospital is too well understood by this body to require discussion. On several occasions it has been necessary to call upon the police force for aid in removing a patient, but in all cases removal was made when attempted. I have sought to overcome this opposition by supplying such accommodations at the hospital as would command the attention and approval of all persons admitted, and with such success that during the past year all citizens afflicted with this loathsome disease have demanded as a right to be admitted to the hospital.

To this date (Nov. 15) there has been reported in the city during the year 191 cases of small-pox; 182 have been removed to the hospital, and 9 have been quarantined at home. Of this number (191) 31 have died—about 16·2 per cent.

The nine cases remaining at home were continuously guarded by police officers, who had entire control of the domicile, superintending all going in and coming out, until the case passed from observation. In case of death, the body is treated and funeral conducted as before indicated.

When the ambulance is ordered to the house to remove a case of small-pox, it is accompanied by an officer who is assigned to the duty of fumigation.

He carries a leather pannier, which contains packages of brimstone, rolls of stout paper three inches wide, a pot of paste with brush. The room or section of the house occupied by patient are prepared for fumigation by raising the carpets and hanging on lines stretched across the room, on which is also hung all clothing, bedding, etc., supposed to be infected.

The crevices about windows, doors, floor, or wherever found, are securely covered by the strips of paper.

A tub containing two or three inches of water is placed in each room, into which a shallow iron vessel is deposited on bricks, which raise the vessel just above the surface of the water.

A sufficient quantity of brimstone is thrown into the vessel, and two ounces of alcohol sprinkled upon it to insure combustion. Fire is applied and the fumigator retires, pasting the door of exit on the outside.

He remains in charge of the house eight hours. If the house is small or the entire house needs fumigating, the occupants are removed for the operation.

The process has proved entirely satisfactory. Sulphurous acid gas is preferred to chlorine gas on account of its cheapness, and the ease and certainty with which it can be generated.

The convalescent, before leaving hospital or domicile, receives several baths or scrubbings in a warm 5 per cent. solution of carbolic acid, special attention being paid to the head. All clothing before leaving the hospital is thoroughly fumigated in the close brick fumigating chamber connected with the institution.

* Read before the Am. Public Health Association at New Orleans, by Dr. J. M. Hall, Chicago, Dec. 9, 1880.

MALIGNANT PUSTULE AND ITS TREATMENT.

DR. CHAS. A. LEALE read a paper before the recent meeting of the Medical Association on the above subject, in which he gave an account of the etiology of the malady, its extremely fatal nature, and described the minute anatomy of the parts in which it usually appears, together with the *modus operandi* of the infection of the contiguous parts, terminating in death by asthenia or heart clot. His method of treatment was, bearing in mind the arteria septi nasi, to make a free incision outward and downward along the course of the fibers of the orbicularis oris muscle, extending the cut each way until all the diseased tissue had been passed, taking care not to go through the mucous membrane lining the lip, to which the disease rarely extended; then with a fine piece of ivory or wood, covered with cotton, he thoroughly applies to the cut surface the chemically pure nitric acid, which is pressed with sufficient force so that every little pocket of pus is reached, and the intervening membranes destroyed, which would otherwise be left to slough and continue the septic or purulent infection. Morphia, p.r.n., should be given, and whisky, liberally and largely diluted with water. In some cases Dr. Leale had been obliged to reapply the acid on the second or third day. His subsequent treatment was, as an open wound, applying ung. bals. Peru, gently on lint, and giving the patient the most nutritious diet and tonics.

Dr. Leale claimed that by this treatment all the little canals making the cut surface appear like a sieve are reached, and that the entire poisonous mass is rendered inert and kept within circumscribed boundaries, and the absorbed poisons, by sustaining the system, were eliminated. In the early part of the treatment a full dose of sulphate of magnesia, largely diluted in water, was given. As a rule, it would be found that on the third or fourth days after the incision and the first application of the acid, all danger will have subsided, and the convalescence will steadily progress, leaving in one case, after an incision over an inch and a half long, a scar on the upper lip not a quarter of an inch in circumference.

But in some instances we may have acute mania from cerebral meningitis or erysipelas; the former to be treated by large hypodermic injections of morphia, and the latter, when possible to be retained, by the cooling lotion of lead and opium.

His conclusions were that carbuncle of the lip, or malignant pustule of the lip, have by the usually recommended modes of treatment proved fatal in a very large proportion of cases, even in healthy, strong, and vigorous adults, and is, therefore, a much dreaded malady. The causes of the failure, in Dr. Leale's opinion, being that, by the usual method of treatment, only a portion of the diseased mass is reached, and consequently the remaining imprisoned *materies morbi* contained in these minute multiple pustules cannot be eliminated, nor can any local application reach the disease.

Dr. Alfred C. Post, of New York, stated that the subject was a most important one, and he was very much pleased with the paper of Dr. Leale. Dr. Post thought that when we see the patients early with malignant pustule a large proportion can be saved. He usually operated by cutting through the vermilion border of the lip.

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